

DS Mix

INSTRUCTION MANUAL
FOR
CP STAINLESS MULTI-FLO HOMOGENIZER
AND HIGH PRESSURE PUMPS

MODEL NO. 3DD1, 3DD2
3DD3, 3DD4
3DD5, 5DD4,
5DD6, 5DD7
7DD8

SERIAL NO. 5DD425-2929

WHEN ORDERING SERVICE PARTS OR REQUESTING INFORMATION ABOUT YOUR MACHINE ALWAYS STATE THE SERIAL NUMBER, NAME OF MACHINE AND MODEL NUMBER OR ANY OTHER PERTINENT INFORMATION THAT WOULD APPLY.

READ COMPLETE INSTRUCTIONS BEFORE
INSTALLATION

KEEP THIS MANUAL IN A SAFE PLACE
FOR FUTURE REFERENCE

ST REGIS
CP DIVISION 1243 W. Washington Blvd., Chicago, Ill. 60607

CP SALES BRANCHES

ATLANTA, GA. 30308 471 Glen Iris Drive, N.E.	DALLAS, TEXAS 75247 8204 Sovereign Row	NASHVILLE, TENN. 37203 90 Franklin Street	PORTLAND, ORE. 97214 2500 S.E. Hawthorne Blvd.
BOSTON, MASS. 02178 (Belmont Station) 33 Brighton Street	DENVER, COLORADO 80202 1851 Lawrence Street	NEW ORLEANS - Call 899-1163	ST. LOUIS, MO. 63132 10420 Trenton Avenue
BUFFALO, N.Y. 14225 371 Nagel Drive	HOUSTON, TEXAS 77003 3709 Polk Avenue	NEW YORK, NEW YORK 10017 633 Third Avenue	SALT LAKE CITY, UTAH 84110 2357 South 8th, West
CHARLOTTE, N.C. 28203 2400 Dunavant Street	KANSAS CITY, MO. 64101 1408 W. 12th Street	OMAHA, NEBRASKA 68106 2322 South 64th Avenue	SAN FRANCISCO, CAL. 94103 1251 Howard Street
CHICAGO, ILL. 60607 1243 W. Washington Blvd.	LOS ANGELES, CALIF. 90023 2905 E. 11th Street	PENNSAUKEN, N.J. 08109 9526 Royal Highway	SEATTLE, WASH. 98104 707 S. Lane Street
	MEMPHIS - Call JA 5-7856	PHILADELPHIA, PA. 19149 P. O. Box 7023	TOLEDO, OHIO 43602 500 Broadway
	MINNEAPOLIS, MINN. 55401 215 - 2nd Street N.	PITTSBURGH, PA. 15212 928 Ridge Avenue	WATERLOO, IOWA 50703 406 Sycamore Street

IMPORTANT NOTICE

These instructions are for installing, operating, cleaning and maintenance procedures expected to be encountered in the assumed normal applications for this equipment, and are presented as a general guide to the purchaser in his interest in obtaining optimum performance and useful life.

Modifications to these recommended procedures may be necessary to adjust to the varying conditions and techniques of processing and use procedures. Such modifications, as well as proper care and maintenance, are the sole responsibility of the purchaser.

These instructions do not constitute a warranty either expressed or implied nor do they modify the standard warranty of CP Div. St. Regis.

CP Div. St. Regis reserves the right to improve, change or modify the construction of its equipment or any parts thereof without incurring any obligation to provide like changes to equipment previously sold.

ST REGIS
CP DIVISION

STANDARD WARRANTY

We warrant to the original purchaser only that the products manufactured by us (and all parts thereof) are free from defects in material and workmanship under normal use and service. Our obligation hereunder shall be limited to repairing or replacing F.O.B. our factory any part of said product which proves to be defective within one year from date of original installation and which our examination thereof shall disclose to our satisfaction to be defective in material or workmanship. Component parts not manufactured by us are warranted only to the extent of the manufacturers' warranties. We are not responsible for damages or consequential damages except as above and all such claims are expressly waived by the purchaser.

This warranty is in lieu of all other warranties expressed or implied and of all other obligations or liabilities on our part, and we neither assume nor authorize any other person to assume for us any other obligation or liability in connection with such products.

ST
CP DIVISION **REGIS**

TABLE OF CONTENTS
FOR
CP STAINLESS MULTI-FLO HOMOGENIZER
AND HIGH PRESSURE PUMPS

	<u>Page</u>
<u>GENERAL INSTRUCTIONS</u> -----	1
Uncrating and Inspection -----	1
Location -----	1
In HTST Systems -----	1
As a Timing Pump -----	2
Sanitary Piping -----	3
Recommended Suction Pressures -----	3
Plunger Cooling System -----	4
Electrical Connections -----	4
<u>INITIAL START-UP AND ROUTINE OPERATION</u> -----	5
Initial Inspection -----	5
Starting the Machine -----	5
Stopping the Machine -----	5
Disassembly of the Sanitary Head -----	6
Disassembly Sequence for 3DD1, 3DD2, 3DD3 and 3DD4 Machines -----	6
Disassembly Sequence for 5DD4, 5DD6 and 5DD7 Machines -----	7
Disassembly Sequence for 7DD813 Machine -----	8
Cleaning the Sanitary Head -----	9
Reassembling the Machine -----	10
Sequence of Assembly Operations -----	10
Sanitizing the Sanitary Head -----	11
<u>CARE AND MAINTENANCE OF SANITARY HEAD</u> -----	11
Handling and Storage of Parts -----	11
The Suction - Discharge Valves -----	12
The Homogenizing Valve -----	12
Pressure Gauges -----	13
"O" Rings -----	13
Plunger Seal Management -----	14
Plungers -----	15
Close Fitting Metal Parts -----	15
<u>CARE AND MAINTENANCE OF DRIVE</u> -----	15
Lubrication -----	15
Motor -----	15
Pump Drive -----	15

TABLE OF CONTENTS (CON'T)

	<u>Page</u>
Speed Reduction Pulley -----	16
Stub Shaft Oil Seals -----	17
Adjustment of Belt Tension -----	18
 <u>HOMOGENIZATION</u> -----	 19
Homogenization of Dairy Products -----	19
Homogenization of Other Products -----	19
Homogenization Efficiency Tests -----	19
References -----	20
 <u>OPERATION AND MAINTENANCE OF THE CP MICRO-SHEAR HOMOGENIZING VALVE</u> -----	 20
General Information -----	20
Operation of the Micro-Shear Valve -----	21
Maintenance of the Micro-Shear Valve -----	22
 <u>INSTRUCTIONS FOR OPERATION AS A HIGH PRESSURE PUMP</u>	 23
Ball Valves and Hardened Alloy Seats -----	23
Pressure Control Valve -----	23
By-Pass Line-----	23
 <u>REMOVAL AND INSTALLATION OF BALL VALVE SEATS</u> ----	 24
 <u>INSTALLATION</u> -----	 24
 <u>INSTALLATION OF HYDRAULIC PRESSURE REGULATOR</u> ----	 25
Operation - Single Stage -----	25
Operation - Two Stage -----	26
Operating Conditions -----	26
 <u>OPERATING AND MAINTENANCE TIPS FOR CP SERIES DD HOMOGENIZERS</u> -----	 26
 <u>TIMKEN BEARING ADJUSTMENT</u> -----	 29
 <u>DRAWINGS</u>	
Hydraulic Pressure Regulator-Manual Control -----	30
Dimensional Diagram-----	31
Air Cushion for Homogenizer Discharge -----	32
Plunger Cooling Water System -----	33
Plunger Seal Assembly -----	34
Oil Seal Assembly -----	35

TABLE OF CONTENTS (CON'T)

	<u>Page</u>
HTST Installations -----	36 - 37
Valves & Block 3DD1, 3DD2, 3DD3, 3DD4 -----	38
Valves & Block 5DD4, 5DD6 & 5DD7 -----	39
Valves & Block 7DD8 -----	40
Bell Flow Valve Assembly -----	41
Turbo Flow Valve Assembly -----	42
Single Stage Micro-Shear Valve - 3DD1, 3DD2 -----	43
Single Stage Micro-Shear Valve - 3DD3, 3DD4, 5DD4 -----	44
Single Stage Micro-Shear Valve - 3DD5, 5DD6, 6DD7 -----	45
Two Stage Micro-Shear Valve Ass'y. 3DD1, 3DD2 -----	46
Two Stage Micro-Shear Valve Ass'y. 3DD3, 3DD4, 5DD4 --	47
Two Stage Micro-Shear Valve - 3DD5, 5DD6, 5DD7 -----	48

This manual covers the installation, operation and maintenance of CP Stainless Multi-Flo Homogenizer and High Pressure Pumps, Models 3DD1, 3DD2, 3DD3, 3DD4, 3DD5, 5DD4, 5DD6, 5DD7 and 7DD8. Satisfactory performance of these homogenizers will depend upon careful installation, intelligent operation and proper maintenance. These machines have been designed and engineered to operate within the capacities noted in this manual.

GENERAL INSTRUCTIONS

Uncrating and Inspection

When uncrating the machine check it carefully against the packing list to see that all parts have been received and nothing has been damaged in transit. Be careful not to throw away any small parts which may be mixed in with the packing material.

If there is any damage, notify your freight agent at once and enter a claim against the carrier. Loss or damage must be established by carrier record either at the time of delivery or by carrier inspection within 5 days after delivery.

All CP Homogenizers and Pumps are tested and inspected before they are shipped. On leaving the factory, they are well crated and in perfect condition. However, we cannot guarantee safe arrival.

Location

1. The homogenizer should be fitted properly into the pattern of existing process equipment.
2. It should be integrated with the processing flow so as to assure optimum homogenization with the best possible operating characteristics.
3. The area selected should be well lighted and clean, and sufficiently large to provide a minimum working space of 24" on all sides of the machine.
4. Adequate head room is desirable. See chart, page 31, for overall dimensions of DD Series homogenizers.
5. The unit should be leveled by adjusting the ballfoot legs, which are then secured by tightening the lock screws provided.

In HTST Systems

By far the greatest number of market milk homogenizer installations are made in conjunction with HTST systems. Some basic rules governing the location of the homogenizer in the system have been established by experience:

1. Product temperature must be above 120° F. (higher temperatures are desirable) for adequate homogenization. Location between the raw (up) side of the regenerator and heater sections or after the heater section (preferable) will meet this temperature requirement.
2. Pasteurization must be completed prior to homogenization, or immediately thereafter, in order to avoid problems with lipolysis and rancidity.
3. If a Vac-Heat unit (or other vacuum treatment) is incorporated into the system, it should be located up stream from the homogenizer to consistently obtain proper homogenization.
4. The homogenizer capacity should be set 3 to 8 per cent above that of the timing pump. In order to balance the two pumps, a by-pass line is used between the homogenizer discharge and suction. A check valve must be installed in the by-pass line when the homogenizer is used with vacuum treating equipment located downstream from the flow diversion valve. This arrangement assures homogenization of all the product, and the timing pump governs the capacity of the system. The excess of product required by the homogenizer is made up through the by-pass line. NOTE: For best operation the use of a check valve in the by-pass line is recommended for all installations.
5. A pressure relief valve of adequate size, installed between the homogenizer and the plate unit, is recommended to prevent damage to the plates in the event of a down stream shut-off.
6. Sketches of recommended installations are provided on pages 36 & 37.

As a Timing Pump

Since the volumetric displacement of the homogenizer is constant, it will serve as the timing unit in HTST systems. However, the use of the homogenizer as the timing pump is not recommended when any or all of the following conditions exist:

1. All products being pasteurized are not also being homogenized.
2. Products to be processed require different holding times.
3. Short runs and frequent shut downs are encountered during processing.

A sketch of a recommended arrangement using the homogenizer as a timing pump is shown on page 36.

Sanitary Piping

Careful consideration should be given to the sanitary piping installation before any pipes are cut. A rough sketch will be helpful in developing the most convenient and efficient piping arrangement. It is desirable that the number of fittings in the system be kept at a minimum. Gasket-seat or CIP type fittings are preferred and must be maintained in good condition to avoid air leaks. Unless the piping is fitted and maintained carefully, the system will be plagued with air leaks and their accompanying "air knocks", pressure fluctuation, incomplete breakup of the fat globules and rapid deterioration of the Bearings, "O" Rings, Plunger Seals and Pressure Gauge.

The product discharge line should be correctly sized to carry the product to its next processing step without an excessive pressure drop. The use of an air cushion in the discharge line of the larger machines (1500-7000 GPH) will reduce vibration due to hydraulic forces. In order to give effective cushioning, a pipe at least 2-1/2 inches in diameter (preferably two pipe sizes larger than connecting pipe) and thirty (30) inches long should be provided. See sketch of recommended hook-up on page 32.

All sanitary lines should be properly supported so that the weight of the lines is not carried by the homogenizer's suction and discharge connections. This is particularly true where large diameter piping is used.

A by-pass line from the homogenizer to the balance tank should be provided to permit by-passing product until the full homogenizing pressure is reached after start-up. The divert line in HTST systems will serve this purpose if the homogenizing pressure is brought to the desired operating level before the forward flow temperature is reached.

Recommended Suction Pressures

A positive suction pressure is required on all homogenizers and high pressure pumps. Homogenizers equipped with poppet type suction and discharge valves require 10-20 PSI suction pressure at capacities up to 2500 GPH and 20-40 PSI suction pressure for capacities of 2500 GPH and above.

Homogenizers equipped with ball type suction and discharge valves require 10-15 PSI suction pressure on DD-1 and 2 models and 25 PSI minimum suction pressure on all other models.

In the event processing circuitry does not supply the above pressures, a booster pump should be utilized to satisfy this requirement.

In HTST systems where a by-pass from the homogenizer discharge to the suction line is used, the suction pressure will approximate the down stream pressure of the system.

Plunger Cooling System

Since the homogenizer is a high-pressure pump, considerable heat is generated by friction in the plunger seals. In order to reduce wear on the plungers and to extend life to the maximum, it is necessary to remove this heat. This is done conveniently by means of a water spray directed on each of the plungers. The machine should never be started unless there is a constant flow of cooling water on the plungers. A steady stream of clean, grit-free water should be supplied to them at all times while the machine is in operation. If at any time the spray holes become clogged or out of proper alignment with the plungers, the condition should be corrected immediately.

A water supply line equipped with a shut-off valve and throttling cock is recommended. See sketch page 33. The flow of water should be generous but well below the point where splashing begins. Once this setting is established with the throttling cock, the setting should remain unchanged and shut-off accomplished with the valve. Check the direction of flow out of the distributor pipe and adjust the piping to direct the streams slightly toward the sanitary head.

The drain from the water chamber must remain open and free of debris at all times. Excessive use of water may cause flooding of the water chamber or splashing onto the stub shaft oil seals, which in turn may cause water to get into the crankcase oil.

Damage to the plungers and seals will occur rapidly if abrasive material is present in the cooling water. The use of a sediment trap or in-the-line filter is recommended if the water supply contains fine sand, iron floc, or other debris. Excessively hard water may cause a build-up of lime on the plungers. Any such accumulation should be removed regularly with a mild acid cleaner.

Electrical Connections

Important considerations when making the electrical connections are as follows:

1. It is recommended that the starter be mounted on a wall or panel near the homogenizer.
2. The overload relays should be selected to match the horsepower of the motor at the voltage, amperage, and frequency indicated on the name plate.
3. Do not use overload relays of excessive capacities as this may result in the burning out of the motor in the event of an extended overload.

4. The motor must be wired to obtain the correct rotation as indicated by the directional arrow on the crankcase cover.

INITIAL START-UP AND ROUTINE OPERATION

Initial Inspection

It is imperative that a complete inspection of the entire homogenizer be made before it is started. The Sanitary Head should be dismantled completely and all parts inspected carefully before reassembling. Frequent reference to the exploded sketch of the sanitary head, page 38, 39, or 40 will serve as a suitable guide in these operations.

Starting the Machine

After the initial inspection and wash up the following steps should be adhered to when making the first test runs with water:

1. Check to see that the crankcase oil level is up to the line in the sight glass when the machine is idle.
2. Turn the cooling water on the plungers and check the drain from the water chamber to be sure it is open.
3. Turn down the pressure adjusting handle until you can just feel the valve stem contact the valve plug, then back it off 1/2 to 1 turn.
4. Start the product feed pump.
5. Start the homogenizer. Some pressure will be developed. Up to 400 - 500 PSI may be expected on the large capacity machines. Adjust the homogenizing pressure to the desired operating level as soon as the machine is pumping at full capacity. Product should be by-passed during the pressure adjustment period. A slight increase in pressure will occur as the machine warms up and some downward adjustment may be required during the first half hour of operation.

Stopping the Machine

When it is necessary to stop the homogenizer the following steps are recommended:

1. Divert homogenized product to supply tank or if at the end of the run, chase it through the system with water.
2. Shut off product feed pump.

3. Relieve the pressure to 500 to 1000 PSI.
4. Shut off homogenizer.

Disassembly of the Sanitary Head

1. Flush out the machine thoroughly with cool water. This will serve to remove accumulated milk solids and reduce the temperature of the homogenizing head.
2. It is important to keep an adequate supply of water to the homogenizer during the flushing operation. Allowing the balance tank to run low on water will permit large slugs of air to be sucked into the system. This results in excessive pounding which is damaging to the single service valve, bearings, "O" rings, plunger seals and pressure gauge.
3. If the machine is to be cleaned by circulation, the exposure time should be short, followed by adequate rinsing. After circulation cleaning and rinsing, the machine should be dismantled for inspection and proper drying.
4. A special table with a rubber or other impervious, resilient cover is recommended for storage of the disassembled parts.

Disassembly Sequence for 3DD1, 3DD2, 3DD3 and 3DD4 Machines (Refer to exploded view page 38)

1. Loosen the sanitary lines and disconnect from homogenizer.
2. Loosen the plunger seal adjusting nuts, No. C.
3. Remove the valve body, part No's. AA through GG. This assembly should be completely dismantled for inspection and cleaning.
4. Remove the homogenizing valve assembly, No's. R through T.
Discard the single service homogenizing valve.
5. Remove the pressure gauge and retaining assembly, No's. V and U.
6. Remove hex nuts, No. HH and lift off the valve port cover, No. PP. Also hex nuts, No. LL and the cover plate of the discharge manifold No. Z and its "O" ring No. Y.
7. Loosen and remove hex nuts, No. L, and the cylinder caps, No. J, at the front of the cylinder block.

8. Drive the cylinders, No. H, back just far enough to loosen the cylinder keys, No. B. A combination cylinder driving and pulling tool, No. VV, is provided for this operation. Place unthreaded end over the cylinder stud and drive with sliding hammer.
9. Remove the cylinder keys, No. B.
10. Pull the cylinders, No. H, out through the front of the block by attaching the threaded end of the pulling tool, No. VV, to the stud at the front of the cylinder. After removal, the seal nut, follower, plunger seal ring and seal seat, Nos. C through F, should be removed from the cylinder. If they do not slip out readily a seal ring and follower pulling tool, No. WW is provided.

CAUTION: Support the cylinders adequately when removing from or inserting them in the cylinder bores. This will prevent their being nicked by striking against mating parts. The resulting burrs may score the cylinder bores and cause "O" ring leakage.

11. Remove the suction and discharge valves, No. M, with their valve springs and spring retainers Nos. N, O and P.
12. The plungers, No. OO, are completely accessible for cleaning without being removed from the machine. This lessens the chance of their becoming damaged by daily removal and handling. It is recommended, however, that they be loosened occasionally and retightened. This serves to insure that the plungers remain tight in their sockets.

Disassembly Sequence For 5DD4, 5DD6 and 5DD7 Machines
(Refer to exploded view page 39)

1. Loosen the sanitary lines and disconnect from homogenizer.
2. Loosen the plunger seal adjusting nuts, No. C. Do not remove.
3. Remove the hex nuts, No. HH and take off the homogenizing valve body, parts Nos. AA through GG. This assembly should be completely dismantled for inspection and cleaning.
4. Remove the homogenizing valve assembly, Nos. R through T. Discard the single service homogenizing valve.
5. Remove the pressure gauge bulb and retaining assembly, Nos. V and U.
6. Remove the hex nuts, No. HH, and lift off the valve port covers, Nos. PP and QQ. Also remove hex nuts No. LL and the end covers of the discharge manifold, No. Z.
7. Loosen and remove the hex nuts, No. L and the cylinder caps, No. J, at the front of the cylinder block.

8. Drive the cylinders, No. H, back just far enough to loosen the cylinder keys, No. B. A combination cylinder driving and pulling tool, No. VV, is provided for this operation. Place unthreaded end over the cylinder stud and drive with sliding hammer.
9. Remove the cylinder keys, No. H, from their slots at the back of the cylinder block.
10. Pull the cylinders, No. H, out through the front of the block by attaching the threaded end of the pulling tool, No. VV, to the stud at the front of the cylinder. After withdrawal, the seal nut, follower, plunger seal and seal forming ring, Nos. C through F should be removed from the cylinder. If they do not slip out readily, a seal ring and follower pulling tool, No. WW, is provided.

CAUTION: Support the cylinders adequately when removing from or inserting them in the cylinder bores. This will prevent their being nicked from striking against mating parts. Burrs resulting from mishandling may score the cylinder bores and cause "O" ring leakage.

11. Remove the suction and discharge valves, No. M, the valve springs, No. N and P, and the suction valve spring retainers, No. O.
12. The plungers, No. OO, are completely accessible for cleaning without being removed from the machine. Leaving them in place lessens the chance of their becoming damaged by daily removal and handling. It is recommended however, that they be loosened occasionally and retightened. This serves to insure that the plungers remain tight in their sockets.

Disassembly Sequence For 7DD813 Machine
(Refer to exploded view page 40)

1. Loosen the sanitary lines and disconnect from homogenizer.
2. Loosen the plunger seal adjusting nuts, No. DL. Do not remove.
3. Remove hydraulic control cylinder from homogenizing valve body.
4. Remove the hex nuts, No. AB, take off the homogenizing valve body, Parts Nos. AD, AE, and AF. This assembly should be completely dismantled for inspection and cleaning.
5. Remove the homogenizing valve assembly, Nos. AG, AH, CA, CB and CD. Discard the single service homogenizing valve No. AH.

6. Remove the pressure gauge bulb and retaining assembly, Nos. BA, BD and BE.
7. Remove the hex nuts, No. BK and lift off the valve port covers, Nos. BH and BF. Also remove hex nuts No. EA and the end covers of the discharge manifold, No. EC.
8. Loosen and remove the hex nuts, No. DA, and the cylinder caps, No. DC, at the front of the cylinder block.
9. Drive the cylinders, No. DF, back just far enough to loosen the cylinder keys, No. DM. A combination cylinder driving and pulling tool, No. FB, is provided for this operation. Place unthreaded end over the cylinder stud and drive with sliding hammer.
10. Remove the cylinder keys, No. DM, from their slots at the back of the cylinder block.
11. Pull the cylinders, No. DF, out through the front of the block by attaching the threaded end of the pulling tool, No. FB, to the stud at the front of the cylinder. After withdrawal, the seal nut, follower, plunger seal and seal forming ring, Nos. DH, DJ, DK, and DL should be removed from the cylinder. If they do not slip out readily, a seal ring and follower pulling tool, No. FA, is provided.

CAUTION: Support the cylinders adequately when removing from or inserting them in the cylinder bores. This will prevent their being nicked from striking against mating parts. Burrs resulting from mishandling may score the cylinder bores and cause "O" ring leakage.

12. Remove the suction and discharge valves, No CF and CJ, the valve springs No. CE and CH and the suction valve spring retainers, No. CG.
13. The plungers, No. DN, are completely accessible for cleaning without being removed from the machine. Leaving them in place lessens the chance of their becoming damaged by daily removal and handling. It is recommended, however, that they be loosened occasionally and retightened. This serves to insure that the plungers remain tight in their sockets.

Cleaning the Sanitary Head

The homogenizer may be cleaned by C. I. P. circulation methods, or manually. If C. I. P. circulation is desired, exposure to the chemicals should not exceed 10 minutes for each cycle, alkali and acid and should be followed immediately by a complete rinse with clear water.

CAUTION: Be certain that the cleaning agents are completely in solution before starting the circulation through the homogenizer, since the suction and discharge valves may be severely damaged by solids in suspension.

If a check valve is used in a by-pass line around the homogenizer, the valve must be removed for C. I. P.

When the homogenizer is circulated as part of the HTST clean-up circuit, it is recommended that it be run only during the last 5-10 minutes of each cleaning cycle, thereby providing for an immediate rinse.

If manual cleaning is desired, all of the disassembled parts should be brushed thoroughly with a suitable general dairy detergent solution. The "O" rings and seals should be removed from their respective positions for cleaning and inspection. Finally, all parts should be rinsed thoroughly with hot water and permitted to drain dry.

Reassembling the Machine

The machine should be left disassembled until entirely dry and preferably until just prior to use. The assembling operation is for all practical purposes the exact reverse of disassembling and until the operator becomes familiar with the machine, can be facilitated by frequent reference to the exploded view on page 38, 39, or 40.

Sequence of Assembly Operations

1. Insert the suction and discharge valves with their corresponding springs. Guide rings are for the suction valve springs only.
2. Assemble the cylinders. See sketch page 34, showing seat, seal and follower relationship and discussion on seal management page 14.
3. Insert the cylinders in the block. Drive into position with the driving tool by placing unthreaded end over cylinder stud.

The front and back "O" rings of the cylinders differ by one size. Care must be taken not to reverse them. Wetting these "O" rings and the cylinder block with water will facilitate positioning of the cylinders in the block.

CAUTION: Support the cylinders adequately when removing from or inserting them in the cylinder bores. This will prevent their being nicked from striking against mating parts. Burrs resulting from mishandling may score the cylinder bores and cause "O" ring leakage.

4. Insert the keys in the cylinder slots at the rear of the block. Do not drop them into position.

5. Replace the cylinder caps and hex nuts at front of cylinder. Draw nuts up snug.
6. Replace the discharge manifold and valve port covers making certain that the "O" rings are in position. Tighten hex nuts securely.
7. Replace the pressure gauge bulb in the valve port cover.
8. Insert a new single service valve and the follower plug in the retainer ring. Be sure the proper "O" rings are in position in the retainer "O" ring grooves. Place assembly in position on the block.
9. Assemble the pressure adjusting mechanism in the valve body. Place valve body over the retainer assembly. Secure with hex nuts.

CAUTION: When tightening the hex nuts on the DD Series machines it is only necessary to use moderate wrench pressure. While nuts must be drawn up snug, excessive tightening will gall the nuts and their mating surfaces. The "O" ring seals in the machines do not require excessive tightening of the hex nuts to achieve a proper seal.

10. Make necessary sanitary piping connections, and the unit is ready to be started.

Sanitizing the Sanitary Head

1. A recognized satisfactory sanitizing procedure, utilizing a chemical agent

5. Replace the cylinder caps and hex nuts at front of cylinder. Draw nuts up snug.
 6. Replace the discharge manifold and valve port covers making certain that the "O" rings are in position. Tighten hex nuts securely.
 7. Replace the pressure gauge bulb in the valve port cover.
 8. Insert a new single service valve and the follower plug in the retainer ring. Be sure the proper "O" rings are in position in the retainer "O" ring grooves. Place assembly in position on the block.
 9. Assemble the pressure adjusting mechanism in the valve body. Place valve body over the retainer assembly. Secure with hex nuts.
- CAUTION: When tightening the hex nuts on the DD Series machines it is only necessary to use moderate wrench pressure. While nuts must be drawn up snug, excessive tightening will gall the nuts and their mating surfaces. The "O" ring seals in the machines do not require excessive tightening of the hex nuts to achieve a proper seal.
10. Make necessary sanitary piping connections, and the unit is ready to be started.

Sanitizing the Sanitary Head

1. A recognized satisfactory sanitizing procedure, utilizing a chemical agent of proven acceptability, should be followed immediately prior to running the machine on product.

CAUTION: Stainless steel is easily corroded by many acid cleaners and especially by halogen sanitizers (chlorine, bromine and iodine). Avoid prolonged exposure to these substances which may cause severe pitting.

2. Sanitizing should be done just before start up on product so that exposure to the sanitizer does not exceed 20 minutes. Use the minimum required concentration at the minimum temperature (50 ppm of chlorine at room temperature is recommended). If, for some reason, product cannot be run immediately after chemical sanitizing, the machine should be flushed thoroughly with water.

CARE AND MAINTENANCE OF SANITARY HEAD

Handling and Storage of Parts

All parts of the homogenizing head are precision machined to close tolerances, and unless these surfaces are carefully maintained the unit will not continue to

give satisfactory performance. The importance of providing a suitable rack or table that will accommodate the disassembled parts, in such a way as to prevent or minimize their contact with each other and with other hard surfaces, cannot be over-emphasized. Constant care by the operators in handling the parts is necessary if damage to the surfaces is to be prevented.

The Suction - Discharge Valves

The suction and discharge valves have been carefully ground and lapped so as to be interchangeable from one seat to another. This makes the condition of the ground surface an even more critical factor in retaining the top volumetric efficiency of the machine. The valves are made of stainless steel, which will give good service, but in time will require grinding. The following procedure is recommended:

1. Set up a program of valve grinding on a monthly or bi-monthly basis. Keeping the valve surfaces in good condition by frequent light grinding is preferable to the extensive grinding required once they have been neglected.
2. Grind the valves lightly with a fine grit (#180) aluminum oxide lapping compound. Iron oxide or emery compounds are to be avoided. (A compact valve grinding kit containing valve and seat grinding tools and a supply of lapping compound is available from CP Division St. Regis.

If the valves are to be replaced, no special care is required other than having the seats in good condition and lapping the valves to the seats. No adjustment of the valve lift is necessary.

The Homogenizing Valve

The Homogenizing Valve assembly of the DD Series Homogenization consists of three essential parts: (1) the retainer, which acts as a seat and guide for the valve; (2) the Bell-Flo valve in the standard machines, or the Turbo-Flo valve in the special or high pressure machines; and (3) the plug, which holds the valve against the valve seat.

All of these parts are made of stainless steel. The Bell-Flo valves are suitable for handling all light bodied products up to 2500 PSI homogenizing pressure. The Turbo-Flo valves are of a low angle design and have a face which is formed from a perforated stainless steel sheet. These valves are suitable for processing heavy bodied or fibrous products at low through high pressures (up to 5000 PSI homogenizing pressure.) These are single service valves, designed to be replaced each day.

It is essential that the operator keep a supply of these valves on hand and use a new one each day for satisfactory results. This procedure will insure the best possible fat globule break-up at a minimum pressure, thereby obtaining the optimum efficiency of the machine.

Normally the retainer and plug will give long service. Service life depends upon the care they are given and the volume and type of product processed. These parts should be replaced when the valve seat shows definite signs of erosion. A new plug should be purchased with each new retainer.

The Turbo-Flo valve is equipped with a replaceable seat which should be changed as often as necessary according to the amount of wear.

Pressure Gauges

The pressure gauge supplied with the 3DD4, 5DD4, 3DD5, 5DD6, 5DD7 and 7DD8 Homogenizers is of the remote indicating type, with the indicating unit mounted in the front panel of the Homogenizer housing. The gauge is mounted on vibration isolators which effectively prevent outside vibrations from affecting the pressure reading, as well as the wearing of pivot points in the gauge mechanism. The gauge for the standard pressure Homogenizers is calibrated for pressures up to 2500 PSI in increments of 50 pounds. High pressure Homogenizers and Pumps have gauges reading up to 5000 PSI.

This gauge is a precision instrument. Care should be taken to prevent damage to the pressure sensing bulb.

The 3DD1, 3DD2 and 3DD3 units are equipped with a 4-1/2" Taylor Dial Gauge. It is regularly supplied with dial set to read for right hand mounting. The dial and pointer can be reset for vertical and left hand mountings, but the change-over should be made only by a representative of the Taylor Instrument Company.

The diaphragm is made pressure sensitive by means of thin metal in order to give accurate readings. It is important, therefore, that the gauges be handled with care to prevent damage. As in the case of other precision parts, it is recommended that some provision be made for safe storage during the time the gauge is not in use on the Homogenizer.

"O" Rings

1. Use only those "O" rings supplied by CP. So called "standard" rings are not likely to be of correct composition, dimensions, or hardness to fit design conditions.
2. The liberal use of water on the cylinder "O" rings at assembly time will aid in the positioning of the cylinders in the head block.

3. Lubrication of the "O" rings with an approved sanitary lubricant is permissible, but excessive amounts should be avoided.
4. The regular cleaning and sanitizing procedures will not injure the "O" rings. They should be washed, rinsed and dried along with the other homogenizer parts.

Plunger Seal Management

Plunger seal management is a vital part in the operation of both homogenizers and high pressure pumps. If the maximum seal life with a minimum amount of wear on the plungers is to be obtained, the following seal management procedure should be followed regularly:

1. Assemble parts in proper relationship to each other. See sketch page 34.
2. Tighten seal nuts by hand only prior to start-up.
3. Turn on plunger cooling water before starting the machine; use only grit free water.
4. Start the machine. Tighten the seal nuts very lightly with a wrench until the pulsations almost disappear.
5. Check the nut tightness after the machine is up to pressure and temperature. Readjust during long runs, if necessary.
6. Adjust seals for change in product temperature. Seals set on cool product will be too tight when hot.
7. Remove seal assembly from the cylinders daily, wash and allow to air dry. (A second set of nylon seats and followers is recommended to permit alternating these parts weekly.)
8. Apply sanitary lubricant to the seals at the time of assembly.
9. Recondition plungers when they are worn .010 inch from their original diameter.

CAUTION: Overtightening the seal nuts may cause:

- (a) Splitting of the seals at the bottom of the "V".
- (b) Distortion of the followers at the "V" so that they can no longer support the seal properly.
- (c) Undue scoring and wear of the plungers.

NOTE: The use of two seals per plunger may be required in some high pressure applications.

Plungers

Under proper management the plungers will give long, trouble free service. It is important that they be brushed clean daily, and that any build-up of water, scale or milk solids be prevented. Avoid excessive tightening of the seal nuts which will tend to score the plungers. Be sure the plunger cooling water is free of any abrasive material.

Some wear of the plungers will occur even under the most ideal operating conditions. When the seal contact area is eventually worn to .010 inches below its original diameter, the plungers should be brought back to size by chrome plating. This service can be arranged by your CP representative.

Close Fitting Metal Parts

Close fitting stainless steel parts of the homogenizers and high pressure pumps are particularly vulnerable to corrosion because the passive surface film is removed or thinned during movement and contact of the parts. Air drying of cleaned parts permits this film to reform. It is, therefore, imperative that the stainless steel parts be dismantled, cleaned and allowed to air dry.

CARE AND MAINTENACE OF DRIVE

Lubrication

The only parts of this machine that require lubrication are the motor, the pump drive and in the case of some special machines, the speed reduction pulley.

Motor

Lubricate the motor as per the motor manufacturer's specifications which accompany it.

Pump Drive

The pump drive is lubricated by means of a flooded system and requires no complicated oil pump and piping arrangement. Visually check the sight glass on the rear of the pump drive cover plate to insure that the proper oil level is being maintained.

It is recommended that any moisture which may accumulate in the crankcase oil be drained out after the homogenizer has been idle over night. This should be done daily. To drain off water, slowly open the petcock in the drain pipe extending from the crankcase through the housing at the back of the machine. Close the drain as soon as any accumulation of water has been removed and the first drops of oil appear. If the oil becomes heavily contaminated with water it is advisable to change it immediately.

The first oil change should be made after about one week of operation. Thereafter, changing the oil every 90 days or 500 hours of operation will constitute a satisfactory schedule.

CP Homo-Lube No. S-1456 is a specially formulated SAE #30 lubricant which has been developed to meet the requirements of homogenizers. This product has outstanding lubrication qualities and under normal operating conditions offers superior protection against corrosion, pitting and rusting caused by moisture in the crankcase. The anti-emulsification properties and chemical stability of this oil aid in preventing its breakdown in the presence of moisture.

NOTE: When refilling the crankcase the removal of one of the center studs from the top of the back cover plate will provide an air vent. This will prevent splash back of the oil in the filler pipe.

Oil Capacity of Homogenizer Pump Drives

<u>Homogenizer Model No.</u>	<u>Oil Capacity</u>
3DD1	1.25 Gallons
3DD2	1.25 Gallons
3DD3	5.0 Gallons
3DD4	5.0 Gallons
3DD5	15.0 Gallons
5DD4	7.25 Gallons
5DD6	18.0 Gallons
5DD7	18.0 Gallons
7DD8	43.0 Gallons

Speed Reduction Pulley

A speed reduction pulley is used on special machines to achieve a wide range of capacities. An oil plug will be found in the side of the pulley. Change the oil after the first 25 hours of operation; there-

after, approximately every 250 hours. Refill pulley with 1-1/2 pints of gear lubricant. Use SAE-80 for temperatures below 32° F. and SAE-90 for temperatures over 32° F. Check the oil level periodically.

Stub Shaft Oil Seals

Normally these seals function well for long periods of time. Several drops of oil should be applied to the stub shafts daily to keep the outside seal from becoming dry and hard. Keep any build up of milk solids or other product from occurring on the seals. This may happen if leaks develop in the plunger seals or near-by products lines. The material should be washed off the stub shafts and seals immediately to prevent its becoming dry and abrasive. The result of negligence may be scored stub shafts and leaky stub shaft seals. It is desirable to have the oil seals seep just enough oil to keep the front seals lubricated. If excessive amounts of oil leak out through the seals, or excessive amounts of water leak into the crankcase, the seals require changing. The seal assembly consists of a retainer and two seals. One seal is faced inward to retain the crankcase oil and one seal is faced outward to prevent entrance of water into the crankcase.

To change the seals in the 3DD1 and 3DD2 models:

1. Screw the plungers out of the cross heads and remove.
2. Pull the two oil seals out of the recess in the crankcase housing with a hooked tool.
3. Soak new seals in oil 10 to 12 hours prior to installation.
4. Face the first seal inward and drive it into the seal recess, using a driving tool with approximately the O.D. of the seal. Locate the seal just past the oil drain hole in the bottom of the recess.
5. Place pilot tool over the threaded end of the plunger. Slip the second seal onto the plunger. Seal lips must face front end of plunger.
6. Remove pilot tool from plunger and slip the threaded end carefully through the first seal and screw into cross head.
7. Drive second seal into recess flush with front of crankcase.

To change the seals in 3DD3, 3DD4, 3DD5, 5DD4, 5DD6, 5DD7 and 7DD8 models:

1. Remove the plungers from the stub shafts.
2. Remove the cap screws holding the seal retainers and slide the retainer assembly forward off the stub shafts.

3. Remove the old seals from the retainers.
4. Install new seals-face one inward and one outward. See sketches page 35.

CAUTION: Use a short length of tubing or pipe approximately the O.D. of the seal casing as a driving tool.

5. Lubricate the new seals liberally before installing them on the stub shafts. Soaking them in oil for 10 to 12 hours is recommended.
6. Use the oil seal pilot tool to slip the seal assemblies over the front of the stub shafts. This is important since damage to the seal lips will occur easily if the pilot is not used.
7. Make certain that the retainer "O" rings are in position and in good condition. Replace them if they show any nicks or cuts, etc. Applying a film of oil to the "O" rings will ease installation of the seal assemblies in the crankcase.
8. Make certain that the drain holes in the retainers are located in the down position.

Adjustment of Belt Tension

The drive from the motor to the crankshaft is through multiple "V" Belts. The tension on this belt drive can be adjusted readily by means of the adjustment screws which support the back of the motor base. After making adjustments see that the motor base is level between the jack screws and that the lock nuts have been tightened adequately. If the belts have not been tightened evenly they may tend to ride off to one side or the other of the crank pulley.

A properly adjusted belt will "give" an inch from its straight line position when pressed firmly at the center point between the two pulleys. Belts which are too tight cause undue strain on the bearings, whereas belts which are too loose may slip causing erratic operation and excessive belt wear.

The belts supplied with CP Series DD Homogenizers are of high tensile strength and designed for heavy duty performance. There is a tendency for new belts to stretch slightly. Because of this, belt tension on a new homogenizer (or new belts) should be adjusted at installation and again after 30 to 50 hours of operation. After the initial stretch has been taken up, the belts will require little attention. However, in order to get the maximum life from the belts, it is important to keep the tension high enough to prevent slippage. If properly adjusted, these belts will give years of trouble free service.

HOMOGENIZATION

Homogenization of Dairy Products

The following is a brief guide of recommended pressures for use with the CP Bell-Flo Valve:

Product	Pressure Range	
	3 cylinder models	5-7 cylinder models
Milk	1500 - 1700	1200 - 1600
Coffee Cream & Half & Half	600 - 1000	400 - 900
Ice Cream Mix	800 - 1800	600 - 1600
Evaporated Milk	1800 - 2100	1400 - 1800

Homogenization of Other Products

The following is a partial list of other products commonly homogenized with CP homogenizers:

1. Salad dressings of various kinds are homogenized to improve their texture and stability.
2. Chocolate syrups and other chocolate products are homogenized to reduce the size of cocoa particles, improve smoothness and stability.
3. Various types of processed cheeses and spreads.
4. Fruit juices, to reduce the size of fibrous particles.
5. Fruit and vegetable purees, to improve smoothness and texture.
6. Liquid and semi-liquid drug and cosmetic products.
7. Gelatin products.
8. Vanilla and other flavoring ingredients.

Homogenization Efficiency Tests

The use of a microscope to observe a dilution of the treated product will give valuable information as to the degree of homogenization that has been achieved.

If clumping is to be detected, the hanging drop slide, or other technique which does not deform the clumps, and relatively low intensity light should be used. The actual diameters of the globules can be measured by means of an ocular micrometer. (This unit must first be calibrated with a stage micrometer to determine the magnification employed.) In general, if 90 percent or more of the globules are reduced to 2 Microns or less in size, homogenization is considered satisfactory.

Farrall (1) developed a microscopic technique in which a numerical grade is used to describe the degree of homogenization.

The USPHS Index (2) for homogenized milk is determined by comparing top and bottom fat tests on a sample which has been stored for 48 hours without agitation at 40° F.

$$\text{USPHS INDEX} = \frac{\% \text{ Fat, Top 100c. c.} - \% \text{ Fat, Remainder}}{\% \text{ Fat, Top 100 c. c.}} \times 100$$

The top 100 c. c is poured off the quart of milk.

Homogenization is considered satisfactory if the top 100 c. c of a quart container, or proportionate amount of other size containers, does not exceed the fat test of the bottom portion by more than 10 percent of itself, i. e., the USPHS Index should not exceed 10.

References

1. Farrall, A. W., Watts, C. C, and Hanson, R. L.
Homogenization Index as calculated from measurement of Fat Globule Size. Jr. Dairy Science, Vol. 24, p. 825, 1941.
2. USPHS Milk Ordinance and Code, Public Health Bulletin No. 220 (1953) p. 22. U. S. Public Health Service, Washington, D. C.

OPERATION AND MAINTENANCE OF THE CP MICRO-SHEAR HOMOGENIZING VALVE

General Information

The new CP Micro-Shear valves are discussed in this section as a supplement to the discussion of CP single service valves on page 12 and 13. The CP Micro-Shear valve can be used singly or in two stage combinations. These combinations may be made up as follows:

Maintenance of the Micro-Shear Valve

Optimum performance of the Micro-Shear Valve depends upon proper alignment and squareness of the valve faces. In order to achieve continued satisfactory performance, it is essential that the valve be maintained in its original condition. A regularly scheduled program of resurfacing the valve faces is strongly recommended. The time interval between lappings will be determined by the product being processed, total hours of operation and the operating pressures. Proper lapping procedure is as follows:

1. Remove the valve body from the sanitary head of the homogenizer.
2. Invert the valve body, with the pressure adjusting mechanism and the valve plug intact.
3. Locate the valve plug so that it is just firmly contacted by the valve seat, when the seat is inserted into its mating valve body recess.
4. Apply a small amount of medium-grit aluminum oxide grinding compound to the valve seat.

NOTE: Use care not to contaminate any of the other surfaces with grinding compound.

5. Rotate the valve seat against the valve plug with the valve body acting as a guide to keep the pieces in proper alignment. The grinding motion used should be of an oscillating (circular) type and the position of the seat in relation to the plug should be advanced periodically to assure uniformity.
6. Make the final lap with a fine-grit aluminum oxide compound, using the same type of grinding motion.

Maintenance of the valve in a properly faced condition is vital to best performance. If channeling occurs across the valve face, it will be impossible to remove by lapping as above and will necessitate return to the factory for refacing. For this reason, it is very important that a regular program be set-up to insure that the valves are lapped frequently.

As with all other "close-tolerance" parts, it is essential that the utmost care be taken in assembly and disassembly of the valve to avoid damage to the components.

INSTRUCTIONS FOR OPERATION AS A HIGH PRESSURE PUMP

The following information refers to the operation and maintenance of high pressure pumps and/or Homogenizers which use the ball type suction and discharge valves and is supplemental to that already covered in the Instruction Manual.

Ball Valves and Hardened Alloy Seats

Ball valves and seats are recommended for all pumping applications above 2500 PSI and for handling products which are high in solids, high in viscosity, contain suspended solid particles, or contain abrasive materials.

Ball valves and seats normally require no maintenance, however, unusual circumstances which may damage either ball or seat merely requires replacement of either part. For replacement of the seat refer to the instructions on page 42.

Pressure Control Valve

The pressure control valve more specifically regulates the volume of product being delivered through the high pressure discharge of the pump. As the valve is closed, less product is permitted to pass through the valve and by-pass back to the suction manifold with a resultant pressure increase. The reverse is true when the valve is opened.

The pressure control valve consists of a mating seat and plug with stellite faces to withstand the abrasive conditions under which they operate. A wear ring is provided to take the abrasive force of the liquid stream as it emerges from the control valve.

To keep the valve faces in true relationship to each other, they should be lapped regularly with fine grit (#180) aluminum oxide lapping compound. If the valve becomes eroded to the extent that it will no longer control pressure satisfactorily, it should be replaced or refaced.

By-Pass Line

A by-pass line is normally used on high pressure pump installations to provide recirculation for pressure variation and control.

The by-pass line can be made of standard sanitary tubing and fittings. For the best operation of the pump, the by-pass line should enter the suction manifold at the opposite end from the product supply line. Avoid piping over the cylinders at the back of the head or diagonally across the front of the head. Either of these conditions will interfere with operation of the machine.

The suction lines should have gasket type fittings and they must be maintained in good condition if the system is to be free of air leaks, which are accompanied by air knocks, pressure fluctuations, pipeline vibrations and untimely deterioration of "O" rings and plunger seals.

REMOVAL AND INSTALLATION OF BALL VALVE SEATS
AND VALVE SEATS

1. The materials needed to remove ball valve seats and valve seats are a long threaded machine bolt or threaded rod, two washers, a piece of 1/2" bar stock and a couple of nuts. A fine thread is recommended. The sizes listed below fit the machines referred to:

3DD1, 3DD2, 3DD3 - 1/2" x 8-1/2" Bolt (Lower Seat)
3DD4, 5DD4 - 1/2" x 3-1/2" Bolt (Upper Seat) 1" OD Nut

3DD5, 5DD6, 5DD7 - 3/4" x 12" Bolt (Lower Seat)
- 3/4" x 5" Bolt (Upper Seat) 1-1/2" OD Nut
2. Place the bolt through two washers, through the stock bar and down through the valve seat. Apply oil or grease to the washers to reduce the friction.
3. Engage the nut below the valve seat and continue turning to withdraw seat. (See Page 40.1)

INSTALLATION

1. Heat the female parts (head block) to a minimum of 300°F. for 4 hours. Head block must be heated in a dry atmosphere to a uniform temperature.
2. Shrink the valve seats in a mixture of dry ice and alcohol for 3-4 hours.

CAUTION: Wear protective gloves when handling dry ice or the cooled parts to prevent serious burns.

3. Quickly place the valve seats in corresponding bores and bottom by driving with a brass plug.
4. Allow parts to return to room temperature.

INSTALLATION OF HYDRAULIC PRESSURE REGULATOR

Homogenizers which are shipped from the factory with the hydraulic regulator installed will be filled with oil and ready for operation. For units which are installed in the field, follow the instructions below for filling the oil system.

1. When all lines are installed and connected, fill the oil reservoir with CP Homolube. Close the pressure regulating valve by turning counterclockwise several turns.
2. Be sure plunger in the hydraulic actuator is retracted as far as possible by removing bleeder plug and pushing actuator upwards.
3. Assemble the actuator to the valve body.
4. At this point, be sure that the booster cylinder plunger is bottomed in the booster cylinder. If it is not, push down through the bleed plug or use air pressure to force it down.
5. Connect the plant air supply. Set the main line air regulator at 8 Lbs. air pressure and open two-way valve to supply air to the oil reservoir. This will fill the booster cylinder and oil lines leading to the hydraulic actuator which has had the bleed plug removed. When all air has been expelled from the oil line, close the two-way valve, replace the bleed plug and the valve is ready for operation.

Operation - Single Stage

1. Set the main line air regulator at a pressure no greater than that required to develop the maximum homogenizing pressure desired.

CAUTION: It is important that this regulator setting be secured with the lock screw to guard against development of excessive homogenizing pressure and possibly overloading the motor.

2. Start the flow of product through the homogenizer. Homogenizing pressure is increased by turning the pressure regulator clockwise, and decreased by turning the pressure regulator counter-clockwise. If pressure fails to develop, it may be necessary to repeat step #5 under installation. NOTE: The homogenizing pressure may or may not reach the same level with the same reading on the air pressure gauge from day to day when used with the single service valve.
3. Daily operation requires adjusting the air pressure regulating valve on the front of the machine only.
4. On large machines of 3000 gallons and higher, residual pressures of 100 to 500 PSI may be encountered. This can be normal and should not be considered malfunction of the hydraulic pressure control.

5. Replacement of the single service valve daily merely requires removal of the valve body from the head of the machine, leaving the actuator assembly installed on the valve body.
6. If the valve body is to be disassembled, remove the actuator from the valve body only, leaving the hydraulic hose in tact so that oil will not bleed out and require refilling when operation is begun.
7. CAUTION: Before removing valve actuator from valve body, be sure the air pressure regulator is backed off so that no air pressure registers on the gauge. This will make valve assembly and disassembly much simpler.

Operation - Two Stage

1. Follow the same instructions as given under 1-7 above for installation.
2. When pressure is applied, bring pressure up on second stage first to desired level and then adjust first stage pressure.

Operating Conditions

1. If pressure fails to develop, the system may contain air or contain an insufficient amount of oil. In either case, back off the air pressure regulator and remove the bleed plug on the actuator to release air. If oil does not flow through the actuator with the bleed plug removed, repeat step #5 under installation to bleed air or add oil to the system. Also make sure the booster cylinder plunger is bottomed when no air is being applied.
2. If excessive pressure develops when the air pressure gauge reads zero, either too much oil is in the system in which case it is necessary to bleed off the excess oil, or the actuator plunger or booster plunger is not retracting far enough, in which case it is necessary to free the booster plunger or actuator plunger and make sure that each plunger is retracting to its base position.

OPERATING AND MAINTENANCE TIPS FOR CP SERIES DD HOMOGENIZERS

These conditions may result from:

Pressure fluctuation.

This

Air in cylinders.
Air leaks in suction line.
Low suction pressure.
Air in product.
Suction-discharge valves need grinding.

Poor homogenization.

Suction-discharge valves in
Poor Condition

Rapid wear of plunger seals.

Plunger seals split in "V" groove.

Scored plungers.

Machine is noisy.

Bearing failure.

Failure to prime on all cylinders.

Failure of cylinders to fill
completely with product.

Belt noise, excessive belt wear, tendency
of machine to gallop (slow down and
speed up).

"O" ring deterioration.

Air problems.
Low operating pressure.
Fluctuating pressure.
Worn valve retainer.
Product by-passing.

Failure to set up and follow a
program of valve maintenance.
Circulating undissolved solid
particles, washing compounds,
etc. through the machine.
Inadequate suction pressure.

Plunger cooling water off.
Grit in plunger cooling water.
Scored plungers.
Seal nuts too tight.

Seats and followers deformed.
Seal nuts too tight.

Plunger cooling water off.
Grit in plunger cooling water.
Seal nuts too tight.

Air leaks in suction lines.
Leaky plunger seals.
Inadequate suction pressure.
Bearing failure.

Failure to change oil.
Excessive moisture in oil.

Suction line air leaks.
Plunger seal leaks.
Inadequate suction pressure.

Suction line air leaks.
Plunger seal leaks.
High viscosity product.
Inadequate suction pressure.

Belts too loose.

Air problems.
Pressure fluctuation.

Crankcase oil contaminated with water, is cloudy, opaque, may be jelled.

Scored stub shafts.

Damaged single service valves.

Failure to drain off moisture regularly. Failure to change oil. Too much water on plungers.
Oil seals leaking.

Too much water on plungers. Flooding of water chamber. Accumulation of milk or other solids on the oil seals.

Air problems.
Fluctuating pressures.
Starving machine.

TIMKEN BEARING ADJUSTMENT

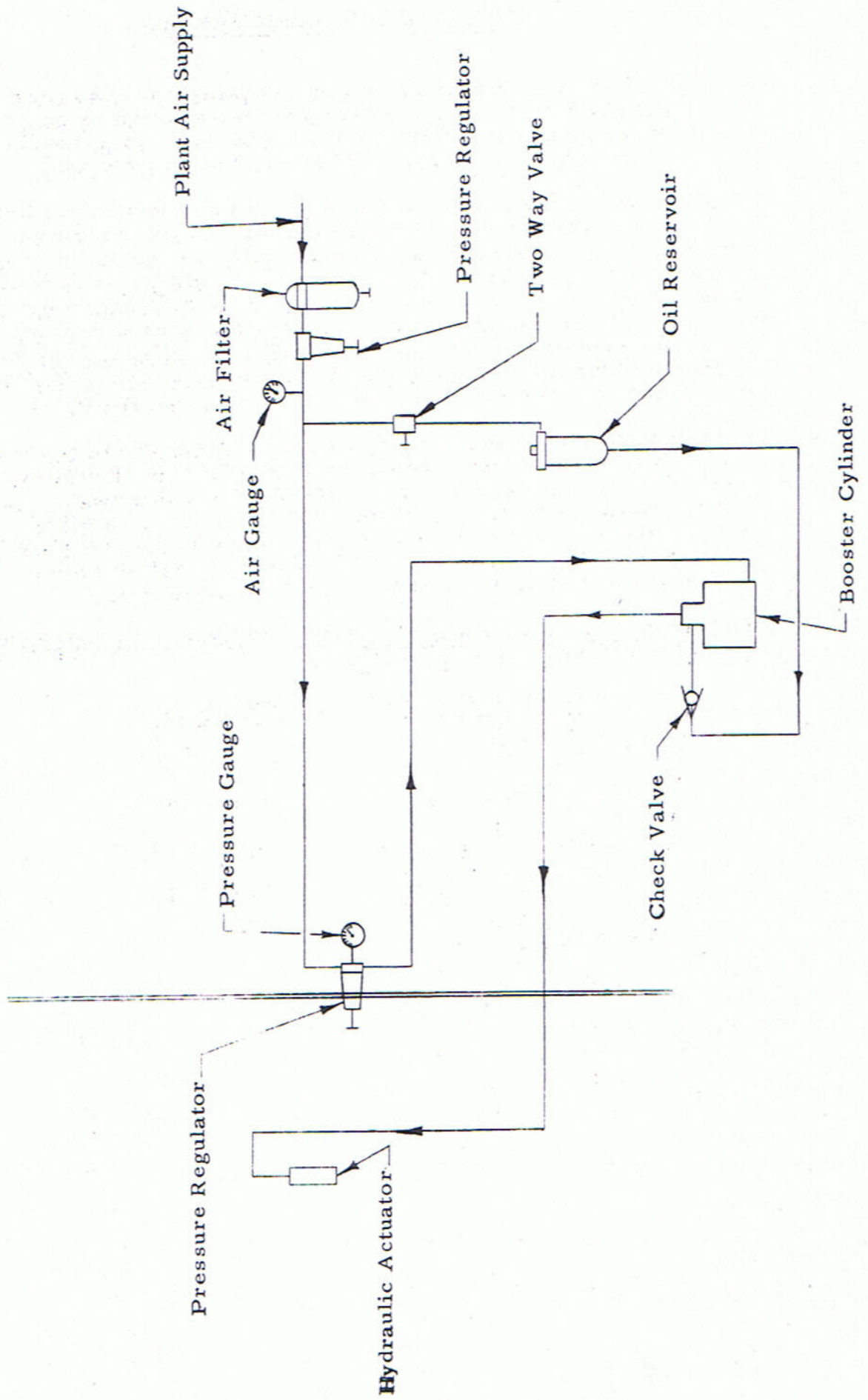
1. Bearing Cones must be assembled solidly against the shoulders on the Crankshaft. Check with a feeler gage for any possible gap between bearings and shoulders before assembling into crankcase. Drive bearing against shoulder if necessary to eliminate gap.
2. Place crankshaft and bearing assembly in crankcase with one bearing carrier assembled tight on crankcase. Bolt bearing carrier on opposite end of crankshaft with three (3) bolts evenly spaced and without shims. Tighten this bearing carrier EVENLY using feeler gages for gap measurements between carrier and crankcase until no end-play results, ROTATING the crankshaft by hand to allow the rollers to adjust to their proper position. Zero end-play exists when the uppermost roller begins to turn with the crankshaft rotation or when no looseness can be felt in the top-most rollers.
3. The total thickness of shims to be used for proper end-play setting will now be the gap measurement plus the end-play allowance. For example, if the gap measures .015" and the end-play wanted is .005", the total thickness of shims would be .020". If plastic shims are used, allow 10% compression loss; total shim thickness then to assemble would be .022". Distribute these shims as necessary for proper crankshaft crosshead alignment.
4. End-play of the crankshaft using Timken Bearings can only be measured while the crankshaft is being rotated.

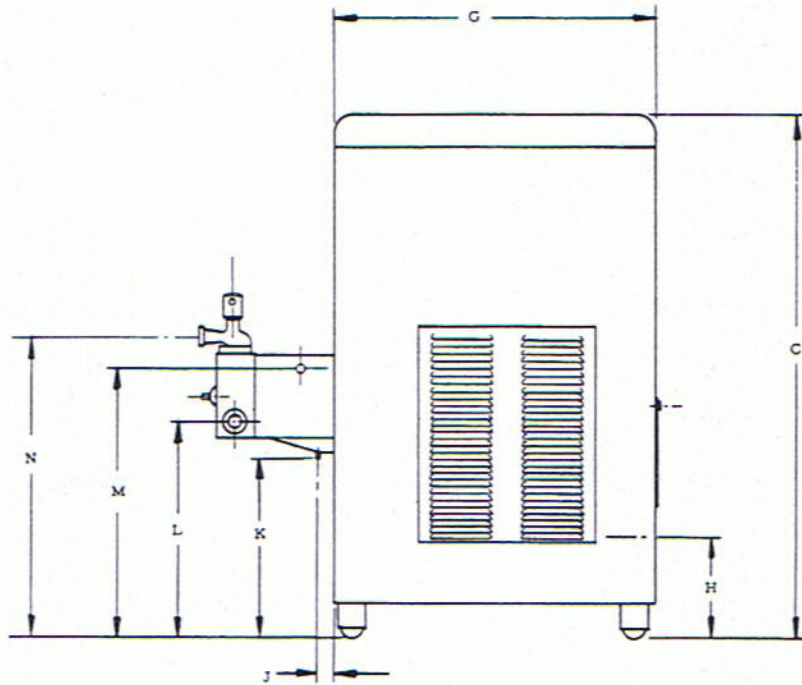
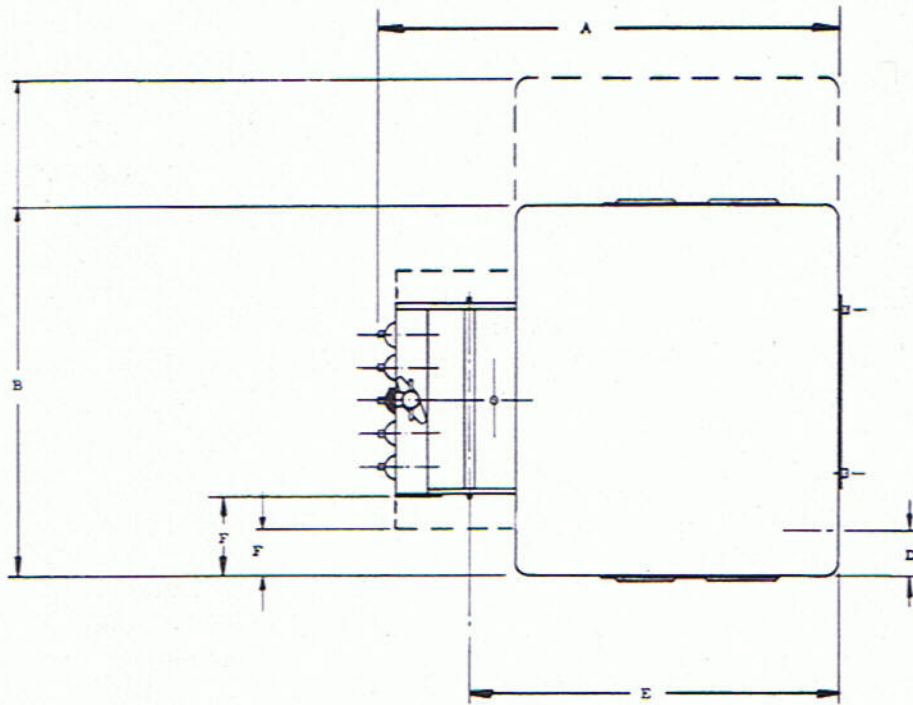
<u>SIZE OF MACHINE</u>	<u>END PLAY</u>
3DD1, 3DD2	.000 - .002"
3DD3, 3DD4	.001 - .003"
5DD4	.001 - .003"
3DD5, 5DD6, 5DD7, 7DD8	.002 - .004"

5. Shim Thickness (Plastic)

Blue	.005"
White	.0075"
Yellow	.020"

CP HYDRAULIC PRESSURE REGULATOR
FOR DD SERIES HOMOGENIZERS
MANUAL CONTROL - SINGLE STAGE SYSTEM

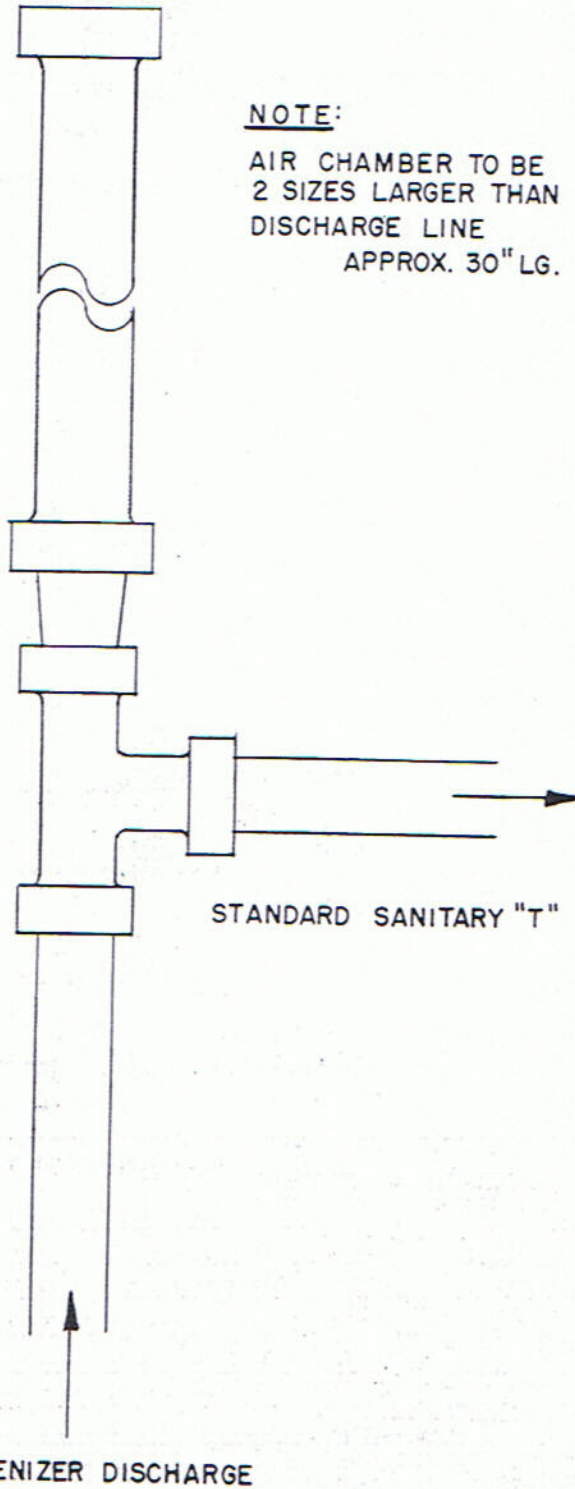




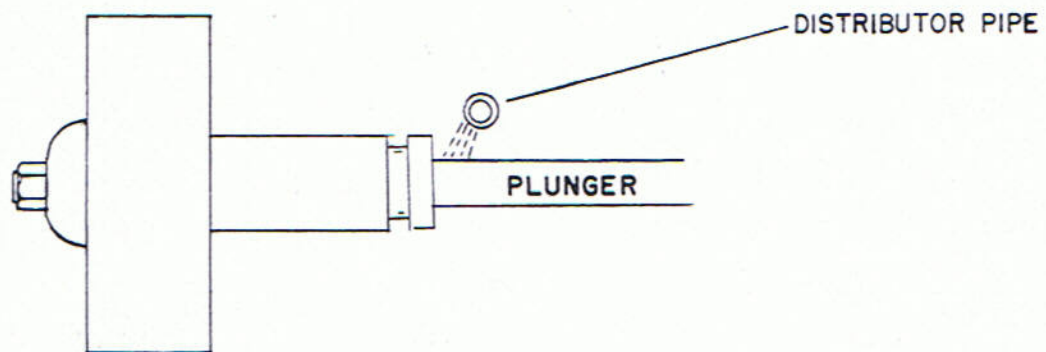
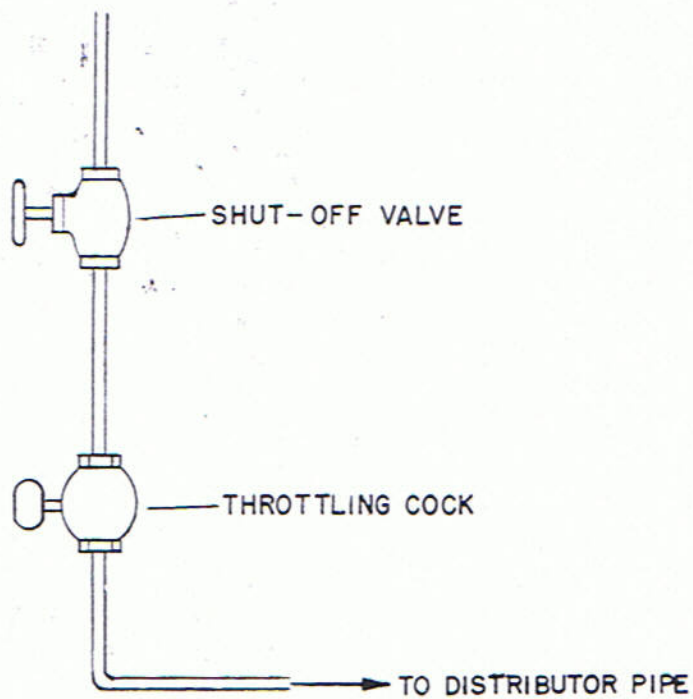
MODEL NO.	GENERAL DIMENSIONS (INCHES)													SUCTION	DISCHARGE	SHIPPING WT. LBS. LESS MOTOR
	LENGTH A	WIDTH B	HEIGHT C	D	E	F	G	H	J	K	L	M	N			
3DDL	39-3/8	23-1/4	45-1/8	1-3/8	32-3/8	5-7/8	25-5/8	9-1/8	1-3/8	10-7/8	14-3/4	17-1/2	23	1	1-1/2	950
3DD13	39-3/8	23-1/4	45-1/8	2-7/8	29-5/8	5-7/8	25-5/8	9-1/8	1-3/8	10-7/8	14-7/8	19-3/8	23	1-1/2	1-1/2	950
3DD25	39-3/8	26-1/4	47	4-5/16	29-5/8	7-3/8	25-5/8	9-1/8	1-3/8	10-7/8	14-7/8	19-3/8	23	1-1/2	1-1/2	980
3DD38	51-1/2	32-1/2	61	4-1/4	40	9-3/9	34-3/8	11-1/8	2-3/4	17	20-3/8	26-7/8	31-3/4	1-1/2	1-1/2	2500
3DD412	53-1/2	37	63-1/4	4-1/2	42	11-5/8	36-3/8	11-1/8	2-3/4	17	20-1/8	26-7/8	31-3/4	2	1-1/2	2780
5DD425 5DD435	61-1/8	48-5/8	70	8-5/16	49-9/16	13-7/16	43-3/4	14-1/8	2-7/8	19-5/8	21-5/8	28-7/8	34-9/16	2-1/2	1-1/2	3160
5DD650	73-1/2	59-1/2	81-3/8	7-3/4	59-1/2	13-1/2	52-3/4	17-7/8	2-1/8	21-1/4	26-7/8	35-3/4	41-1/4	3	2	9600
5DD775	73-1/2	59-1/2	83	7-3/4	59-1/2	13-1/2	52-3/4	17-7/8	2-1/8	21-1/4	26-7/8	35-3/4	41-1/4	3	2	9675

DF-1126

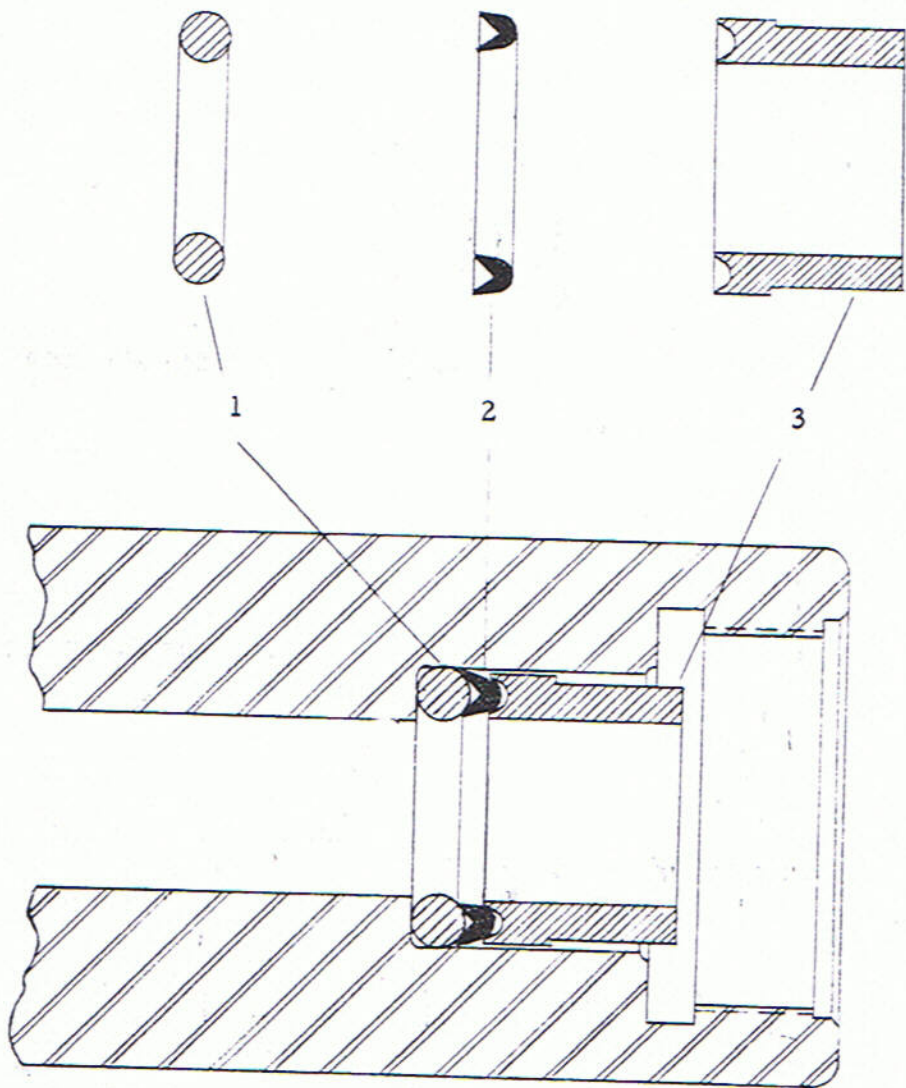
AIR CUSHION FOR HOMOGENIZER DISCHARGE LINE



RECOMMENDED PIPING
PLUNGER COOLING WATER SYSTEM



PLUNGER SEAL ASSEMBLY

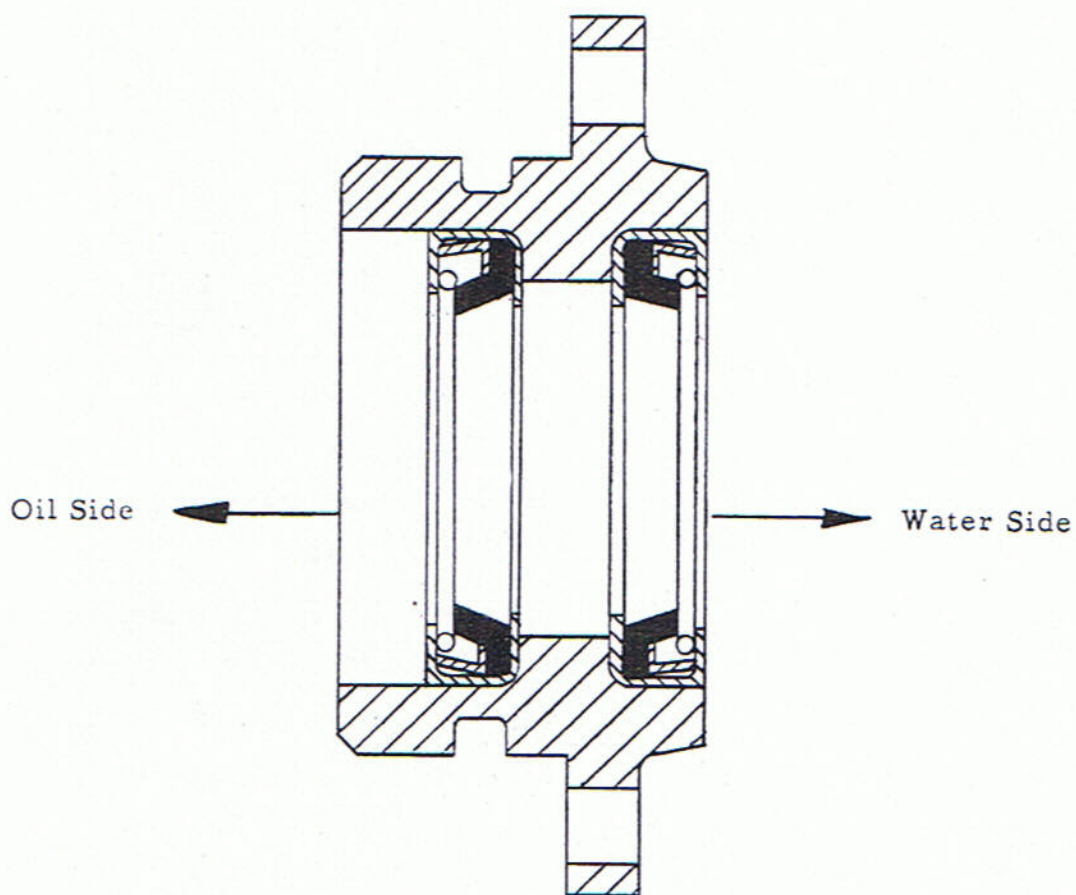


NOTE:

THIS IS THE ORDER OF INSTALLATION AND CORRECT POSITIONING OF THE SEAL SEAT, AND FOLLOWER IN THE SEAL CAVITY.

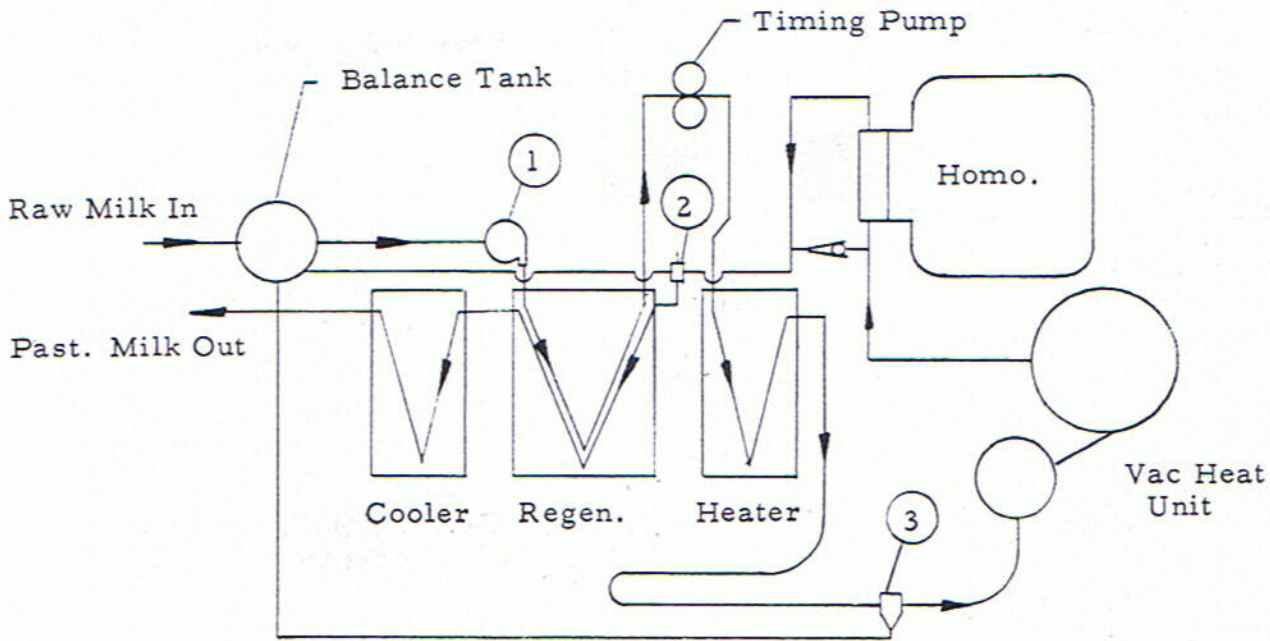
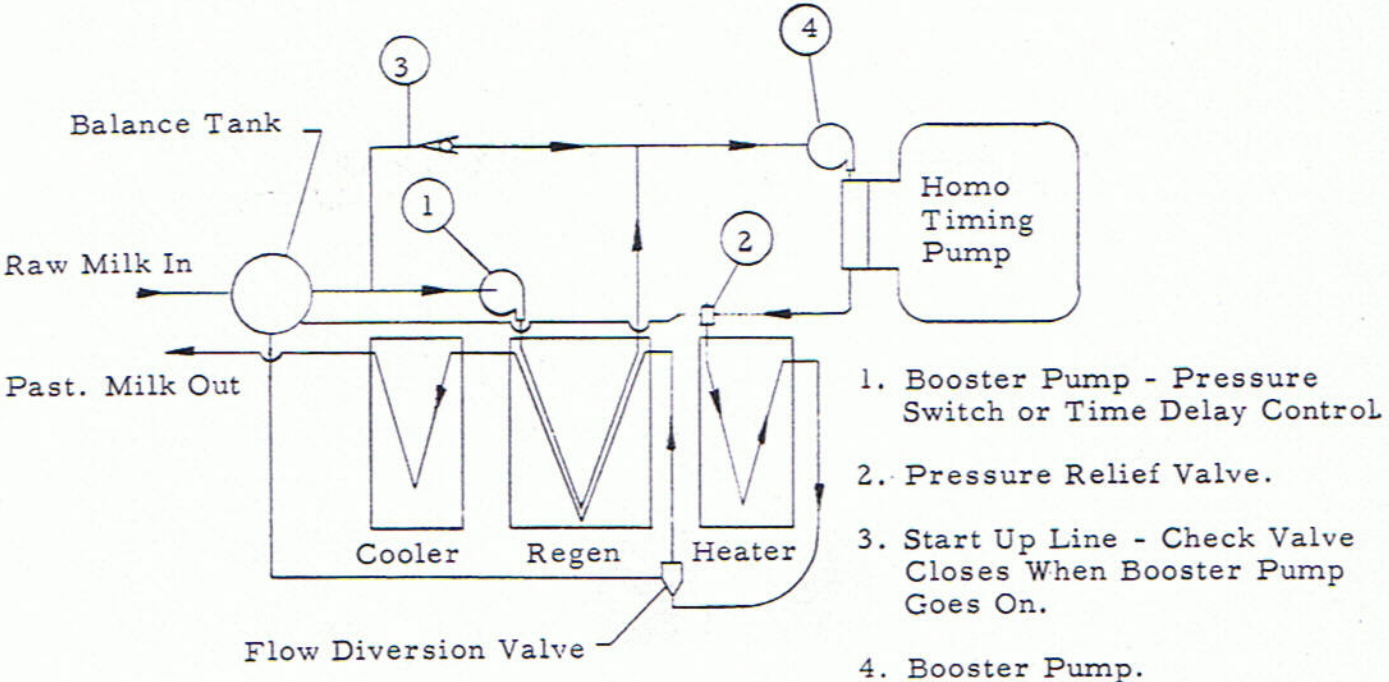
OIL SEAL ASSEMBLY
FOR 3DD3, 3DD4, 3DD5, 5DD4, 5DD6, 5DD7
AND 7DD8 HOMOGENIZERS

SEALS ARE INSTALLED DIRECTLY IN
CRANKCASE ON 3DDL, 3DD1 AND 3DD2 MACHINES.



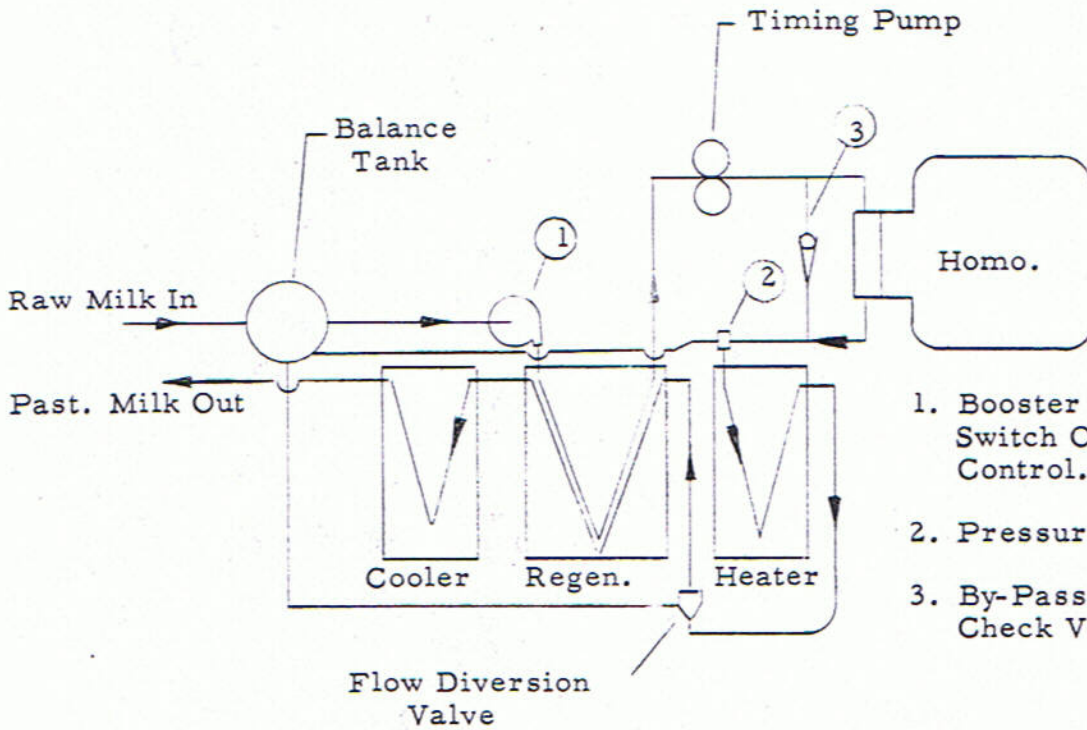
NOTE DIRECTION IN WHICH SEALS MUST
BE FACED IN ORDER TO SEAL PROPERLY.

TYPICAL HOMOGENIZER - H.T.S.T. INSTALLATIONS

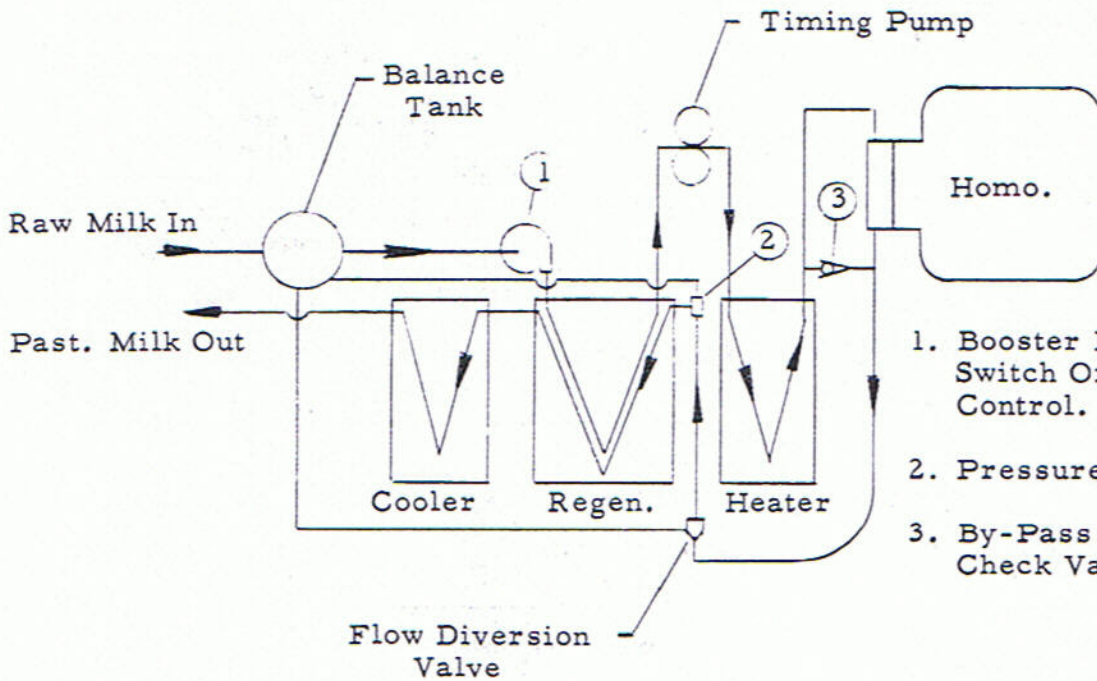


- 1. Booster Pump
- 2. Pressure Relief Valve
- 3. Flow Diversion Valve

TYPICAL HOMOGENIZER-HTST INSTALLATIONS

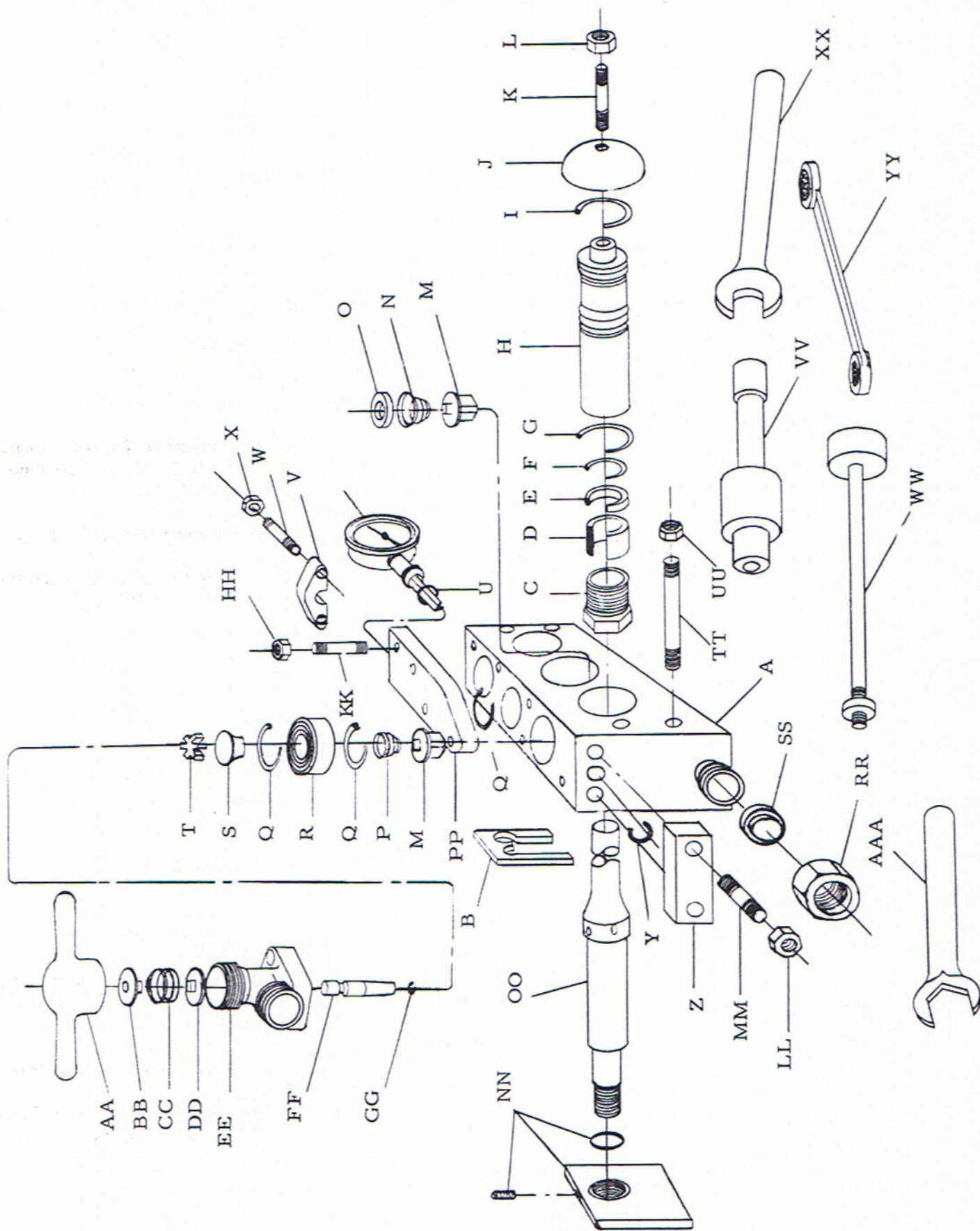


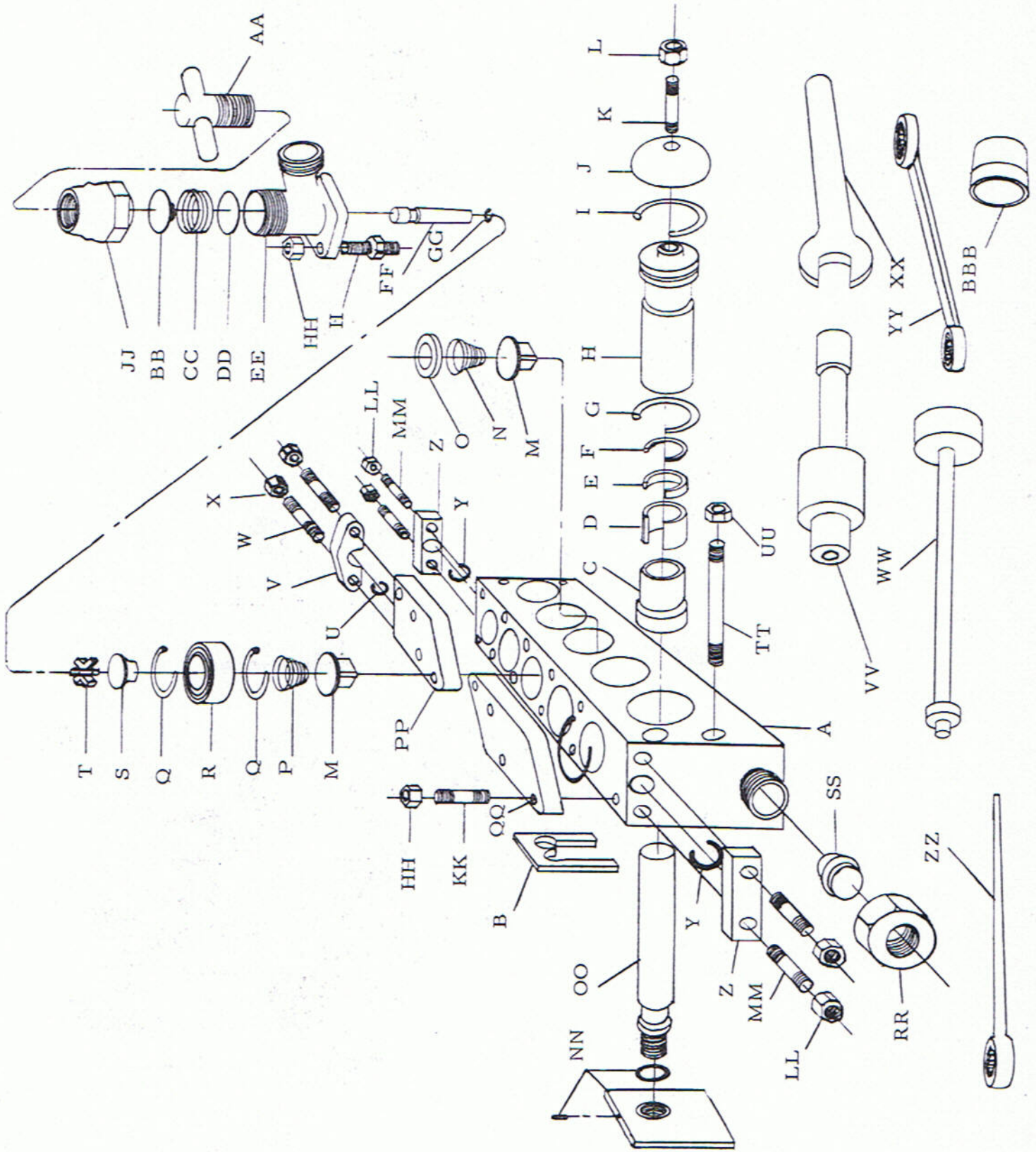
1. Booster Pump Pressure Switch Or Time Design Control.
2. Pressure Relief Valve.
3. By-Pass Line - Must Have Check Valve.



1. Booster Pump Pressure Switch Or Time Delay Control.
2. Pressure Relief Valve.
3. By-Pass Line - Must Have Check Valve.

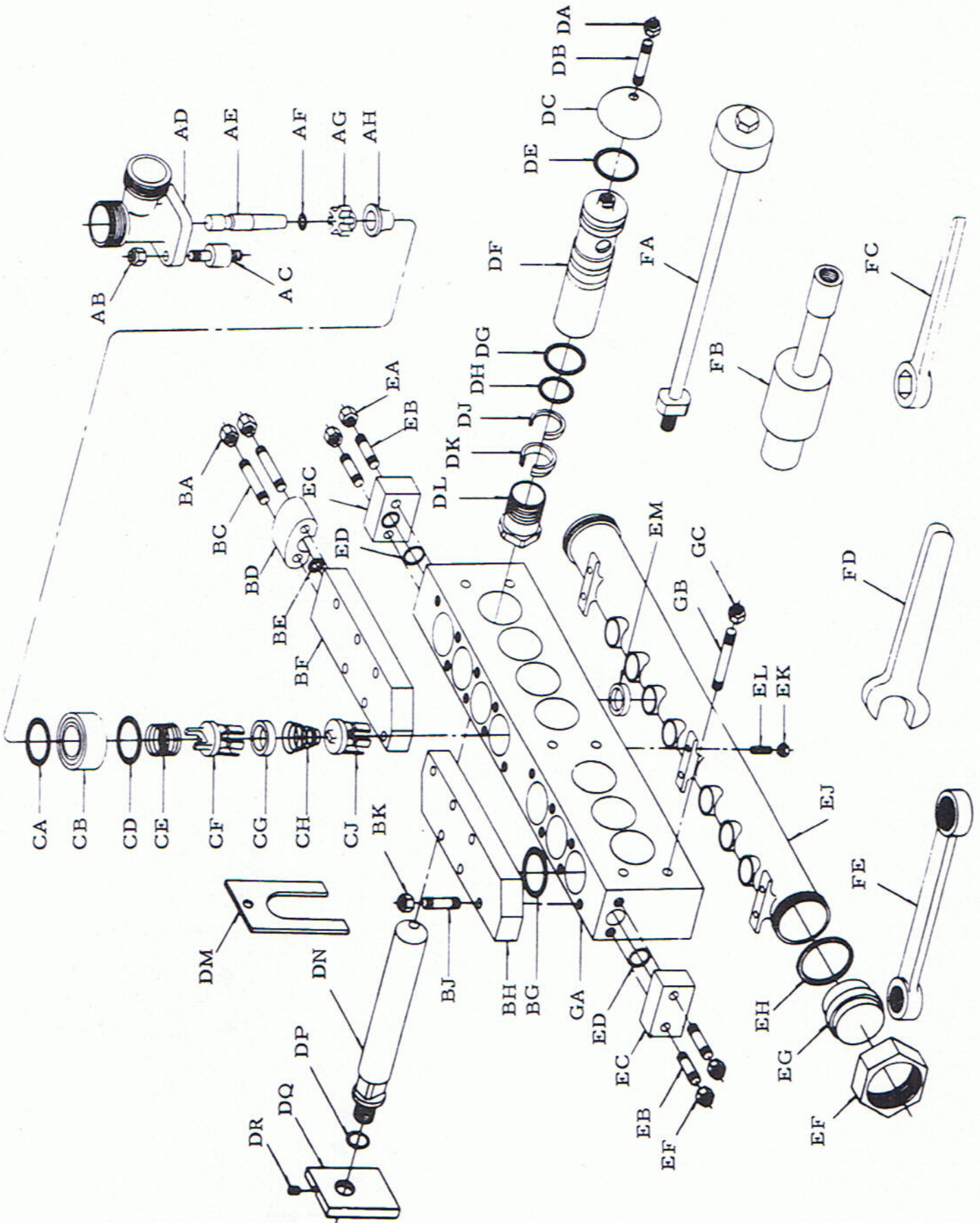
VALVES & BLOCK
3DD1, 3DD2, 3DD3 & 3DD4



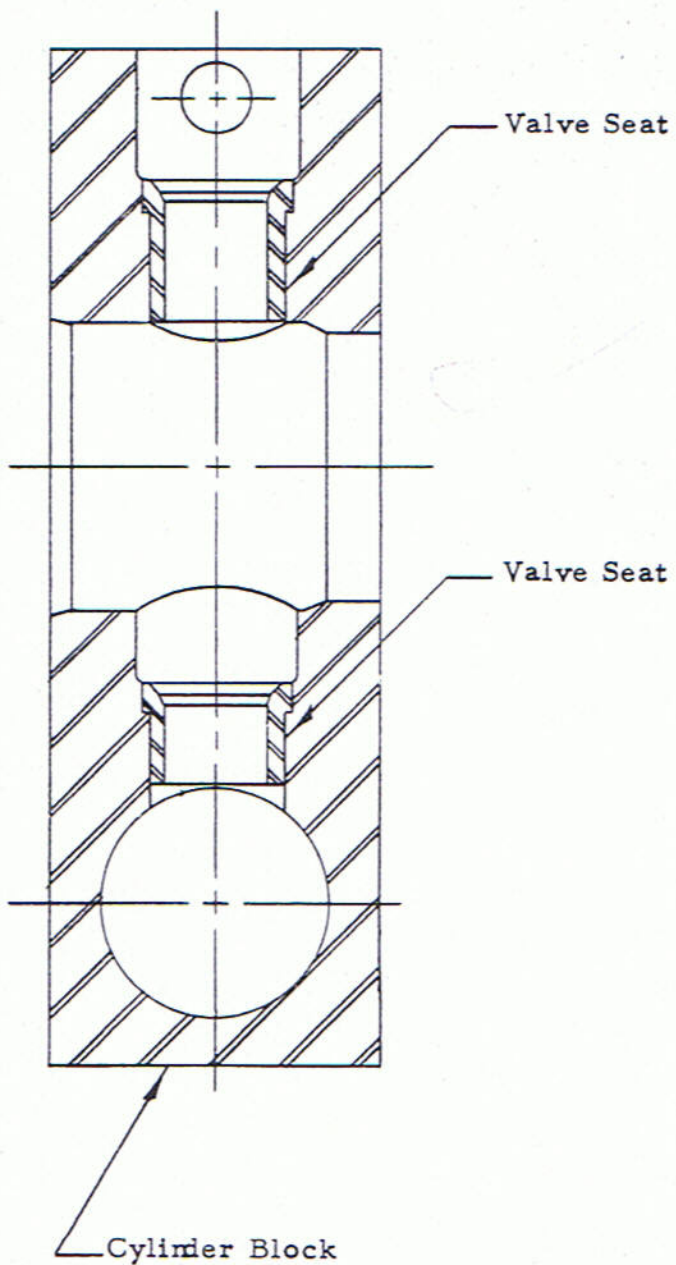


1A51-2010

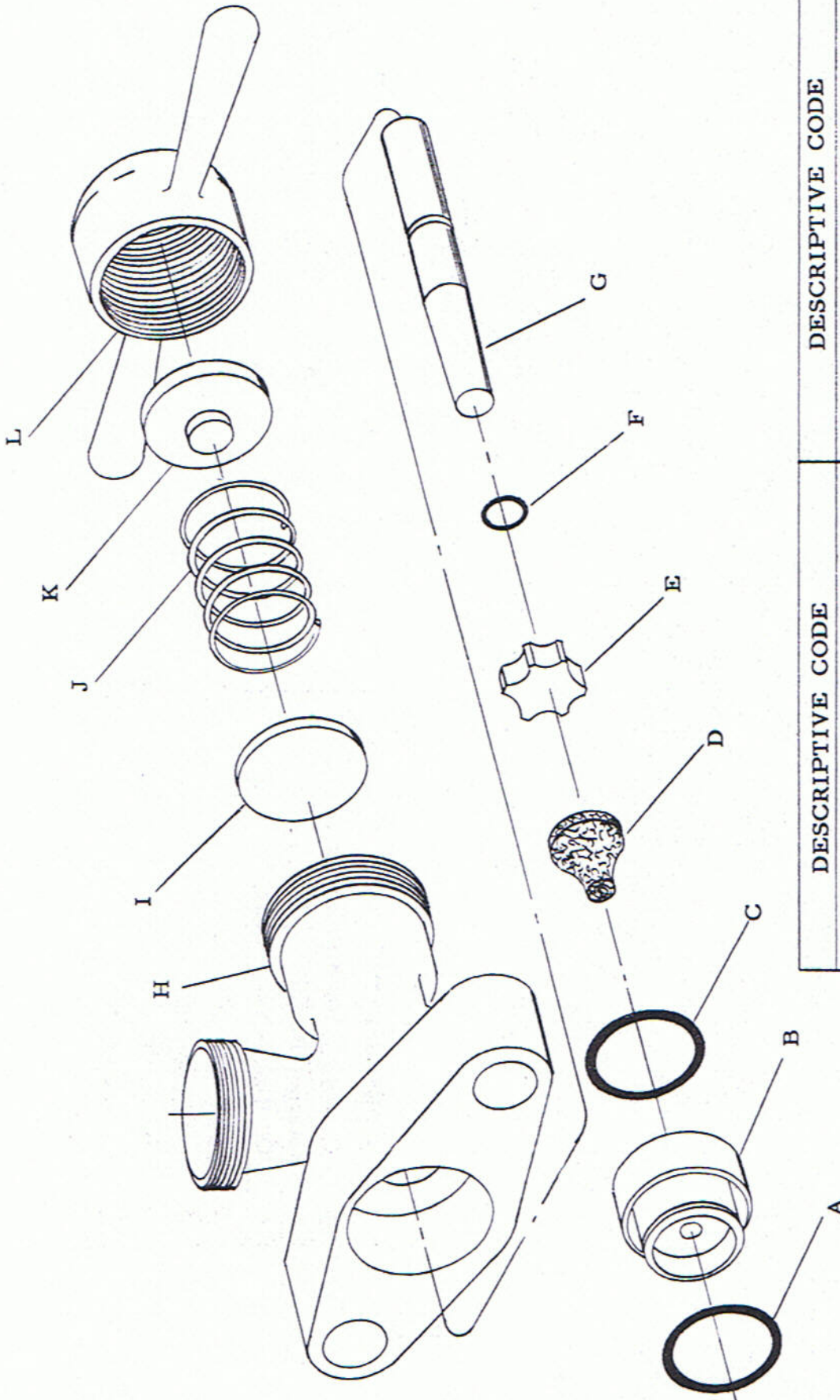
VALVES & BLOCK
7DD8



SLEEVE INSERTION DRAWING

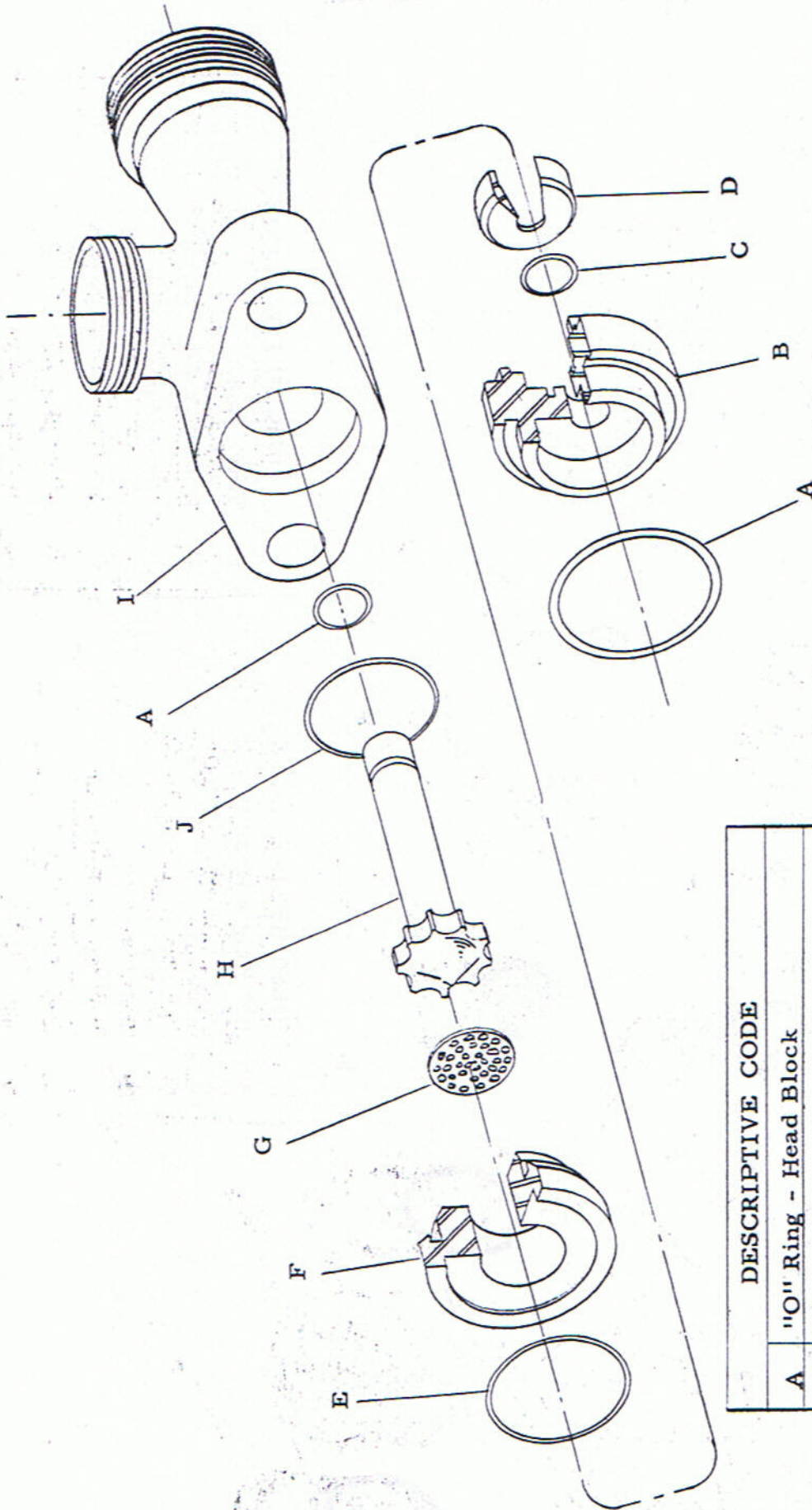


BELL FLOW VALVE ASSEMBLY



DESCRIPTIVE CODE	DESCRIPTIVE CODE
A	"O" Ring - Head Block
B	Retainer
C	"O" Ring - Retainer
D	Bell Flow Valve
E	Valve Plug
F	"O" Ring - Valve Stem
G	Valve Stem
H	Valve Body
I	Pressure Adj. Guide
J	Pressure Adj. Spring
K	Pressure Adj. Bearing
L	Adjusting Nut

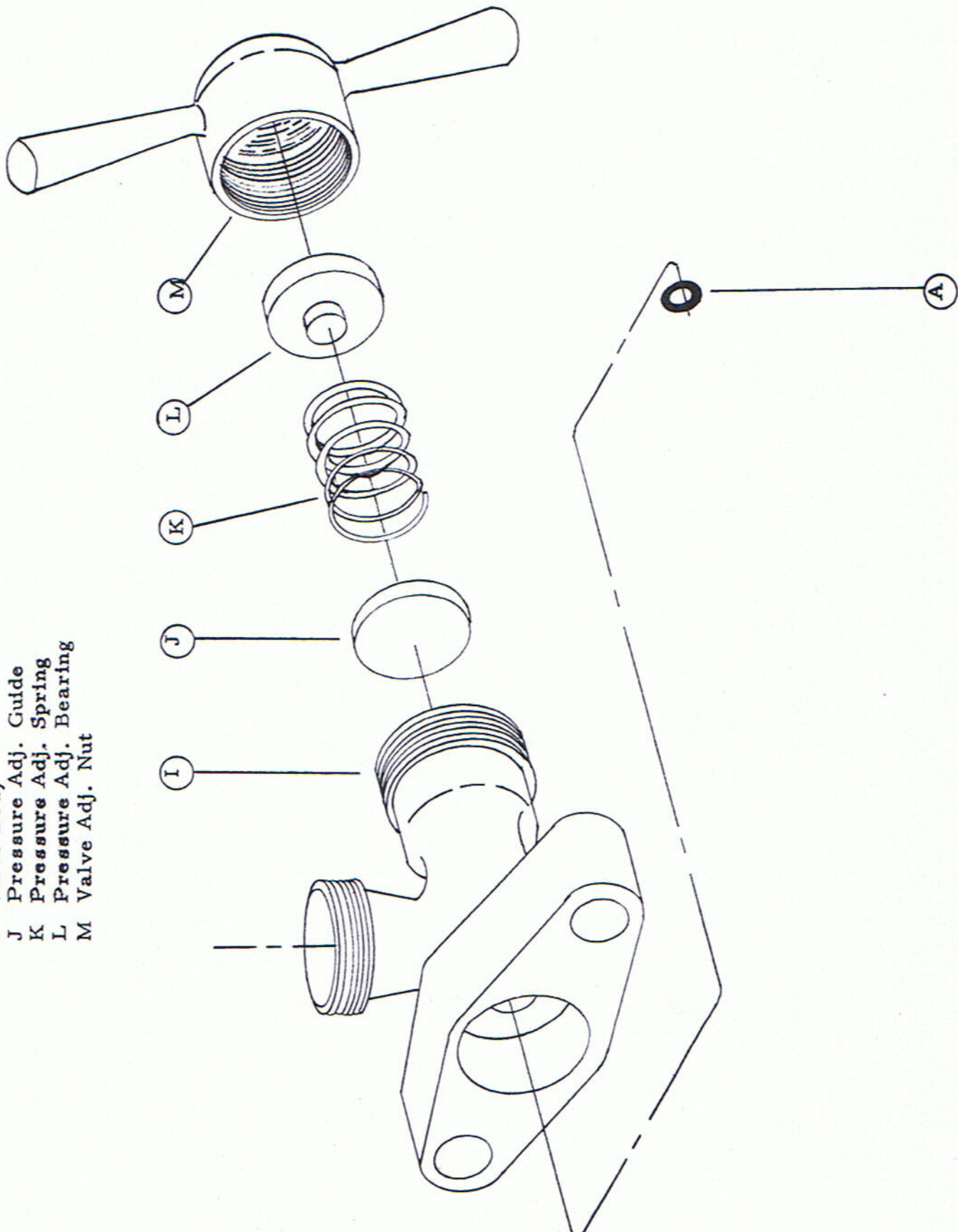
TURBO FLOW VALVE ASSEMBLY



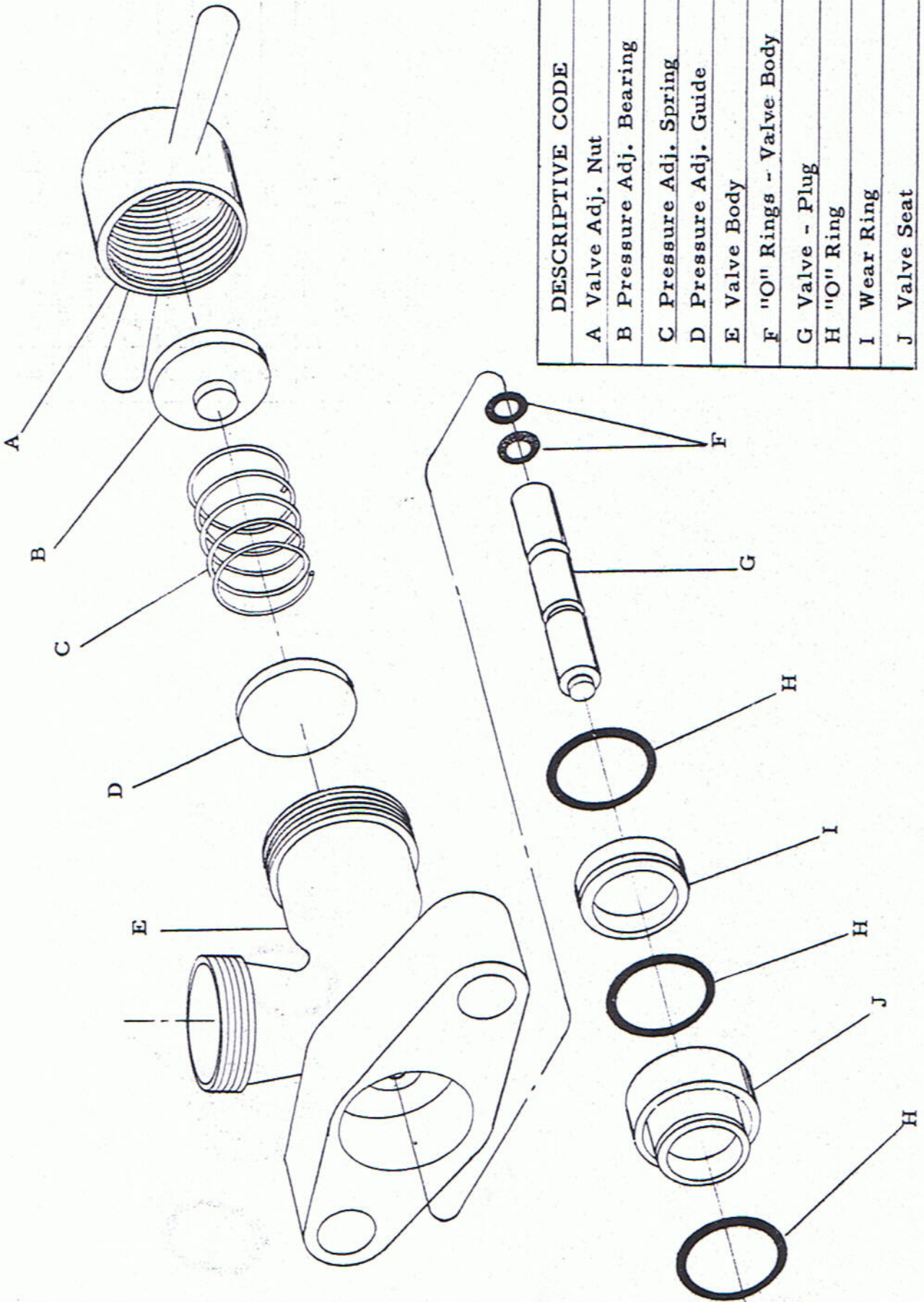
DESCRIPTIVE CODE	
A	"O" Ring - Head Block
B	Retainer Bottom
C	"O" Ring - Valve Seat
D	Valve Seat
E	"O" Ring - Retainer
F	Retainer Top
G	Turbo Flow Valve
H	Extension Plug
I	Valve Body
J	"O" Ring - Ext. Plug

Description Code

- I Valve Body
- J Pressure Adj. Guide
- K Pressure Adj. Spring
- L Pressure Adj. Bearing
- M Valve Adj. Nut

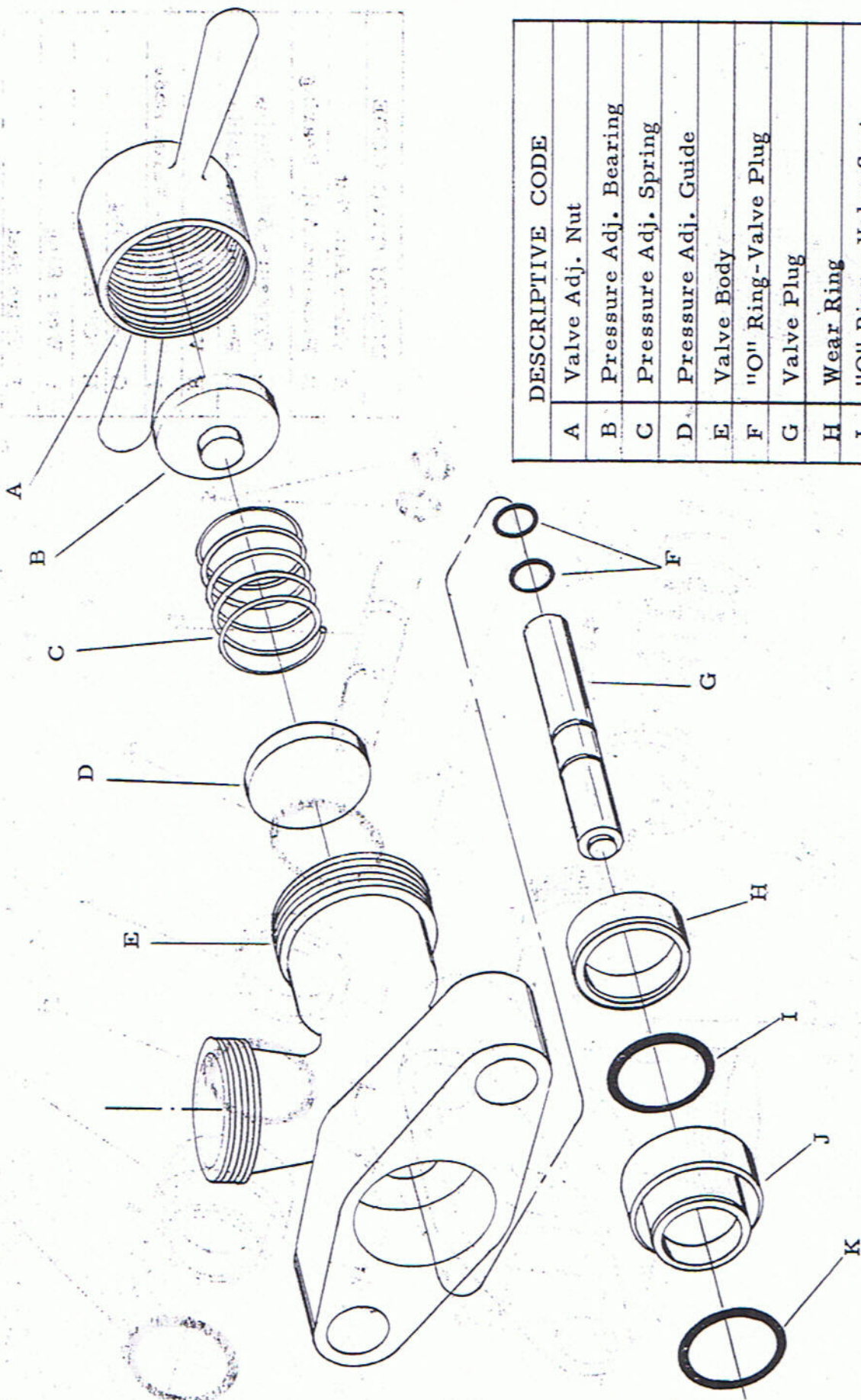


SINGLE STAGE MICRO-SHEAR VALVE
3DD1, 3DD2 HOMO.



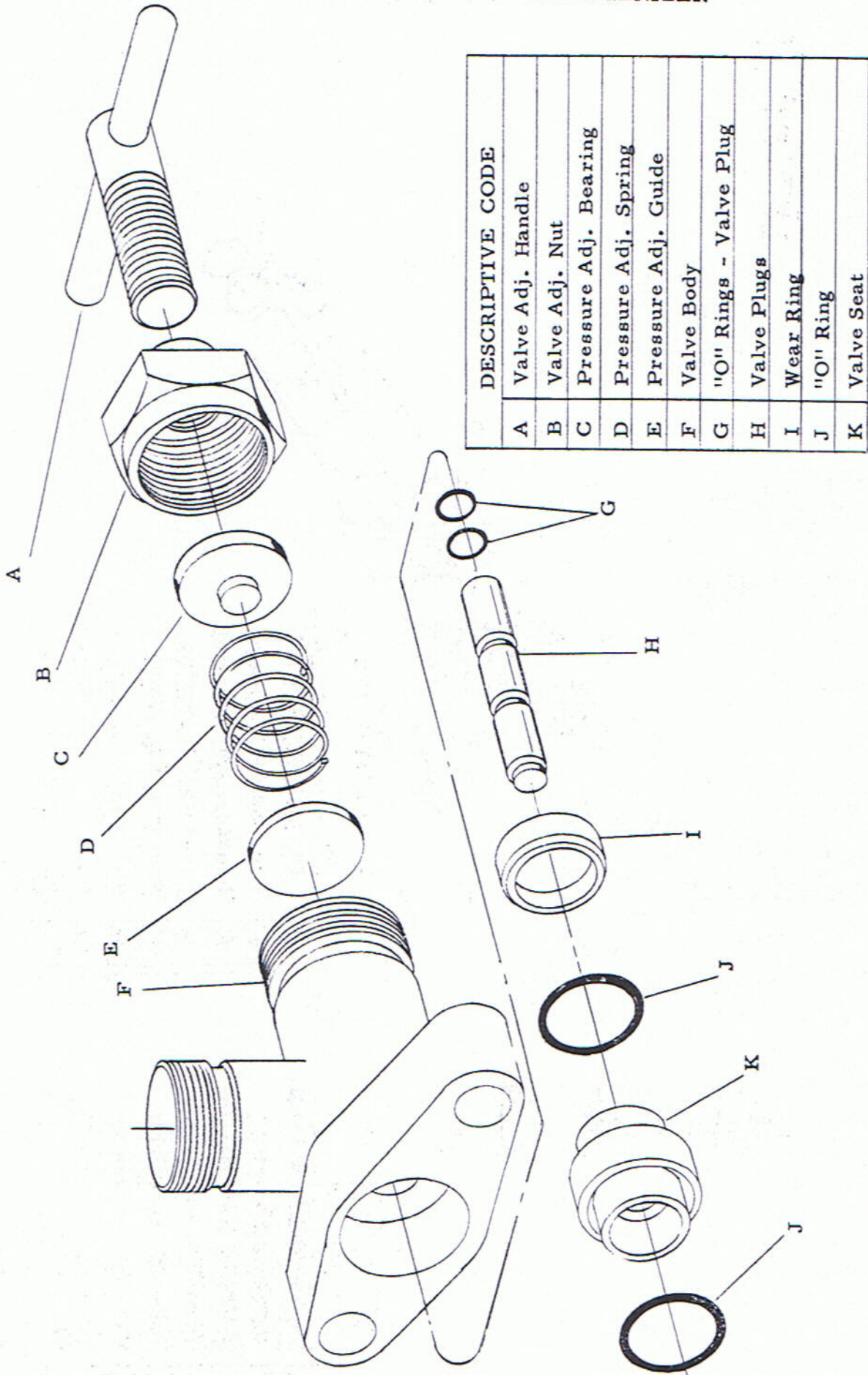
DESCRIPTIVE CODE
A Valve Adj. Nut
B Pressure Adj. Bearing
C Pressure Adj. Spring
D Pressure Adj. Guide
E Valve Body
F "O" Rings - Valve Body
G Valve - Plug
H "O" Ring
I Wear Ring
J Valve Seat

SINGLE STAGE MICRO-SHEAR VALVE
 3DD3, 3DD4, 5DD4 HOMOGENIZER



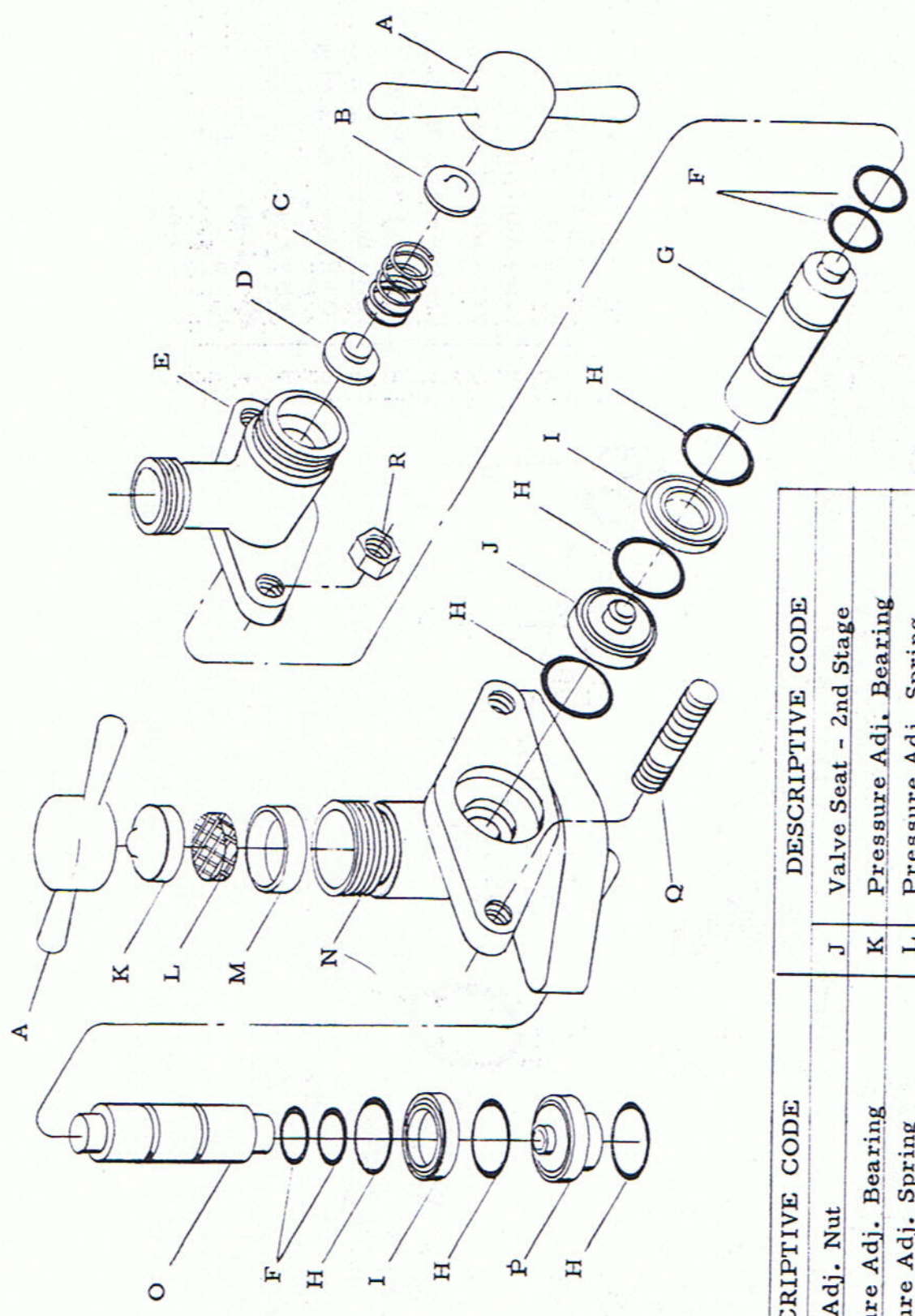
DESCRIPTIVE CODE	
A	Valve Adj. Nut
B	Pressure Adj. Bearing
C	Pressure Adj. Spring
D	Pressure Adj. Guide
E	Valve Body
F	"O" Ring - Valve Plug
G	Valve Plug
H	Wear Ring
I	"O" Ring - Valve Seat
J	Valve Seat
K	"O" Ring - Head Block

SINGLE STAGE MICRO-SHEAR VALVE
 3DD5, 5DD6, 5DD7 HOMOGENIZER



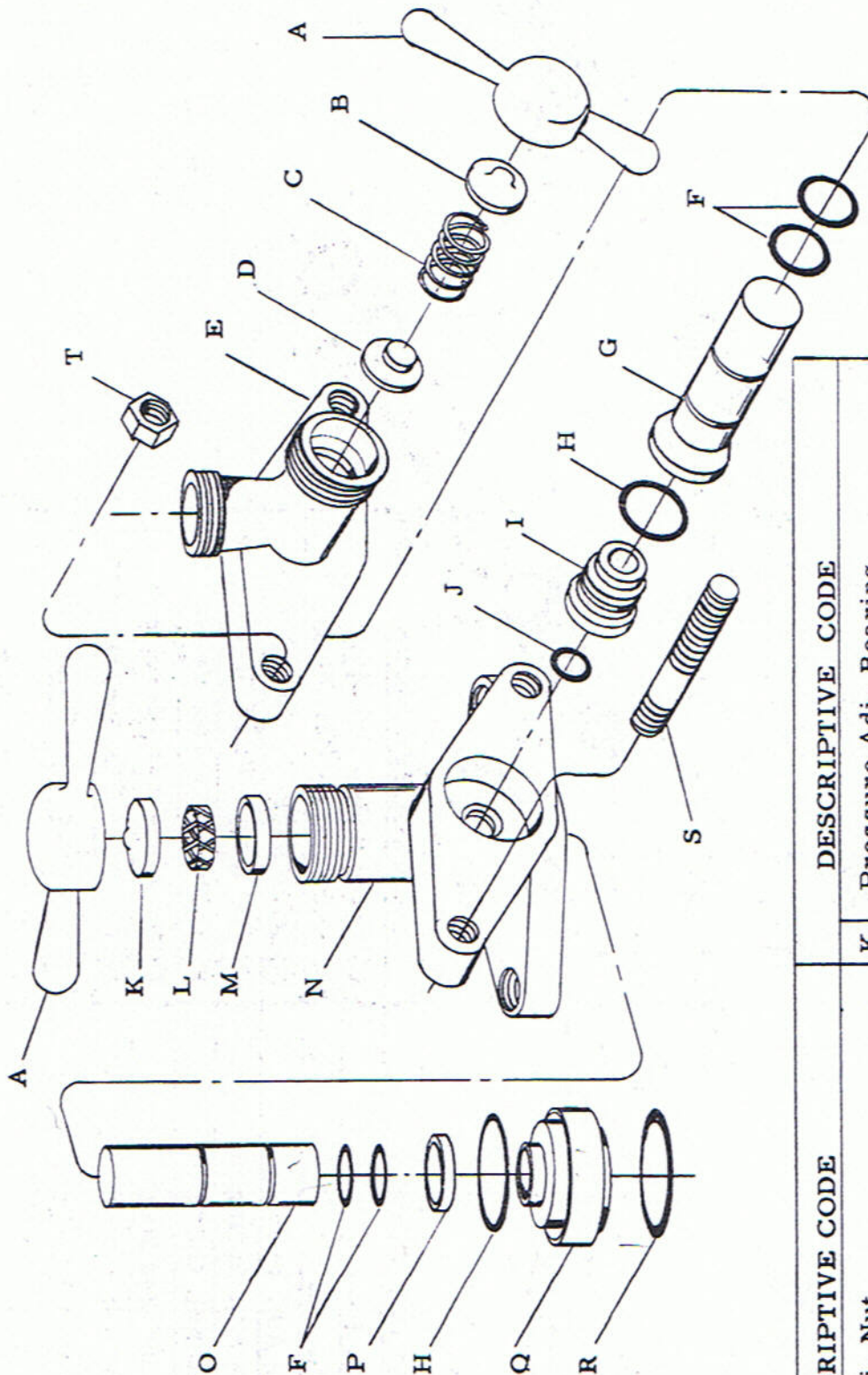
DESCRIPTIVE CODE	
A	Valve Adj. Handle
B	Valve Adj. Nut
C	Pressure Adj. Bearing
D	Pressure Adj. Spring
E	Pressure Adj. Guide
F	Valve Body
G	"O" Rings - Valve Plug
H	Valve Plugs
I	Wear Ring
J	"O" Ring
K	Valve Seat

TWO STAGE MICRO-SHEAR VALVE ASSEMBLY
3DD1, 3DD2 HOMOGENIZER



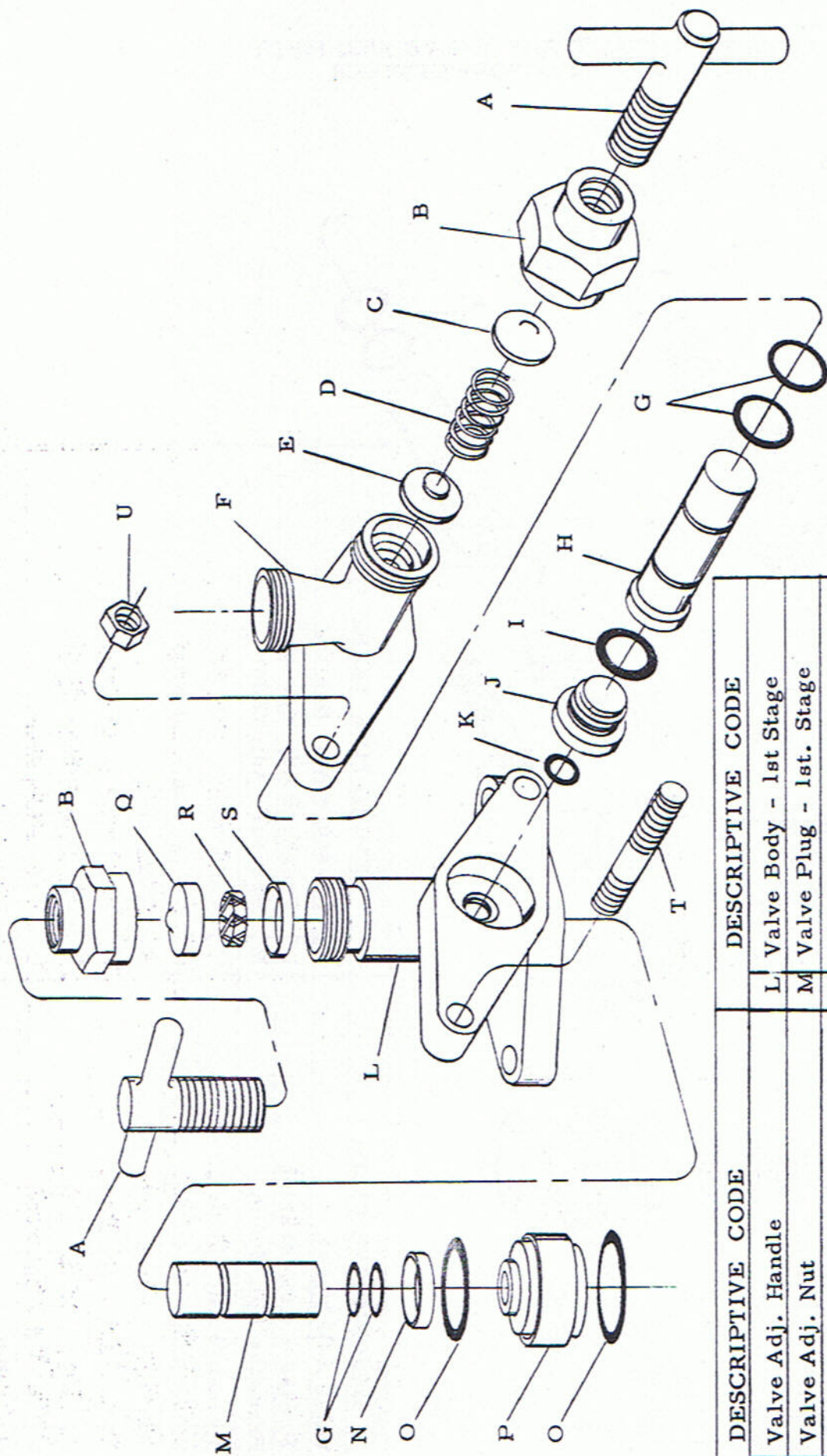
DESCRIPTIVE CODE	DESCRIPTIVE CODE
Valve Adj. Nut	J Valve Seat - 2nd Stage
Pressure Adj. Bearing	K Pressure Adj. Bearing
Pressure Adj. Spring	L Pressure Adj. Spring
Pressure Adj. Guide	M Pressure Adj. Guide
Valve Body - 2nd Stage	N Valve Body - 1st Stage
"O" Ring - Valve Plug	O Valve Plug - 1st Stage
Valve Plug - 2nd Stage	P Valve Seat - 1st Stage
"O" Ring - Wear Ring	Q Stud
Wear Ring	R Hex. Nut

TWO STAGE MICRO-SHEAR VALVE ASSEMBLY
3DD3, 3DD4, 5DD4 HOMOGENIZER



DESCRIPTIVE CODE	DESCRIPTIVE CODE
A Valve Adj. Nut	K Pressure Adj. Bearing
B Pressure Adj. Bearing	L Pressure Adj. Spring
C Pressure Adj. Spring	M Pressure Adj. Guide
D Pressure Adj. Guide	N Valve Body - 1st. Stage
E Valve Body - 2nd Stage	O Valve Plug - 1st Stage
F "O" Ring - Valve Plug	P Wear Ring
G Valve Plug - 2nd Stage	Q Valve Seat - 1st Stage
H "O" Ring - Valve Seat	R "O" Ring - Head Block
I Valve Seat - 2nd Stage	S Valve Body Stud

TWO STAGE MICRO-SHEAR VALVE
3DD5 5DD6 5DD7 HOMO



DESCRIPTIVE CODE	DESCRIPTIVE CODE
A Valve Adj. Handle	L Valve Body - 1st Stage
B Valve Adj. Nut	M Valve Plug - 1st. Stage
C Pressure Adj. Bearing	N Wear Ring
D Pressure Adj. Spring	O "O" Ring - Valve Seat
E Pressure Adj. Guide	P Valve Seat - 1st. Valve
F Valve Body - 2nd Stage	Q Pressure Adj. Bearing
G "O" Ring - Valve Seat - Plug	R Pressure Adj. Spring
H Valve Plug - 2nd Stage	S Pressure Adj. Guide
I "O" Ring - Valve Seat	T Stud
J Valve Seat - 2nd Stage	U Hex. Nut
K "O" Ring	



ULTRA-V DRIVE TENSIONING INFORMATION

The total tension in a set of belts on an Ultra-V belt drive is the same as the total tension in a set of belts on a Conventional V-Belt Drive, if the design horsepower, driver, speed, ratio, diameters and center distance are the same. Because in general, Ultra-V drives will have fewer belts and higher horsepower ratings per belt, they must be operated with greater *individual* belt tension. This greater *individual* tension plus the smaller cross section will change the feel of the Ultra-V belt compared to the feel of the conventional V-belt when static tension is applied to the drive.

To help new users of Ultra-V drives to become accustomed to this new feel and be able to automatically properly tension the drive the following procedure should be followed.

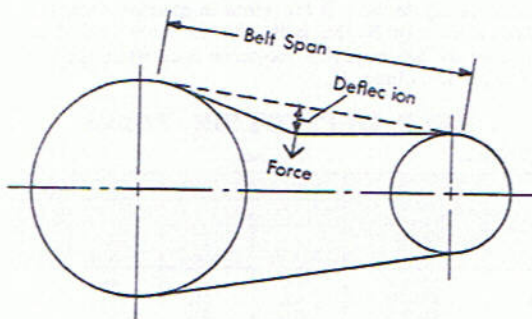
All V-belt drives require an initial run-in period during which initial stretch is removed from the belt and seating of the belts in the grooves takes place. To compensate for this loss in tension the drive is installed with greater tension than required for normal operation. Ultra-V belts are no different in this respect.

Step 1:

After placing the set of matched belts in the sheave grooves take up the slack in the belt and start the drive. Tension the drive until the belts have only a SLIGHT BOW on the slack side of the drive while it is operating under load.

Step 2:

Stop the drive and measure the belt span (See Sketch). Using a spring scale apply a force to any ONE of the belts in the center of the span. The force should be perpendicular to the span and toward the center of the drive. Measure the force required to deflect any one of the belts $\frac{1}{4}$ inch for every inch of span length. For example, the deflection for a 32-inch span would be $\frac{1}{4}$ inch multiplied by 32, or 8 inches.



Step 3:

The amount of force required to deflect the belt should compare with the recommended values listed in table 46a. Initially, you should tighten the belts to the values listed in column A. There will normally be a drop in tension during the first 24 to 48 hours of operation. During this "run-in" period the belts seat themselves in the sheave grooves and the initial stretch is removed. After a day or two the drive should be stopped again and another check made for the correct amount of tension. The tension should now compare with the values in column B. If the force is below the low value in column B, the belts are too loose and should be tightened. If the force is greater than the high value in column B, the belts are too tight and should be loosened so that the deflection force is between the high and low value in column B.

BELT DEFLECTION FORCE

Table 46a

Belt	Small Sheave Diameter	Deflection Force (lbs.)	
		A "Run-in" Period	B Normal Running
3V	2.65 to 3.65	6	3 to 4½
	4.12 to 6.00	8	4 to 6
5V	7.1 to 10.9	16	8 to 12
	11.8 to 16.00	20	10 to 15
8V	12.5 to 17.0	36	18 to 27
	18.0 to 22.4	40	20 to 30

INSTALLING A WOOD'S ULTRA-V BELT DRIVE

INSTRUCTIONS

1. Install the belts in the grooves without forcing.
2. Align the drive by the four-point method with a piece of string or a straightedge. The two sheaves will be aligned when two points (near and far) on the face of each of the sheaves touch the straightedge or the string when the string is a straight line.
3. Tension the belts by moving the motor back till only a SLIGHT BOW appears in the belts on the slack side of the drive while it is running under full load.
4. If you wish to make sure you have applied the proper tension STOP the drive and go through the steps listed above.
5. Keep in mind that Ultra-V belts have high horsepower ratings and, therefore, need high individual belt tensions. However, since fewer belts are used than a comparable conventional drive, the total tension on the drive is essentially the same.
6. The feel of the Ultra-V belt will be unlike that of a conventional belt. It may feel tight and yet be undertensioned.

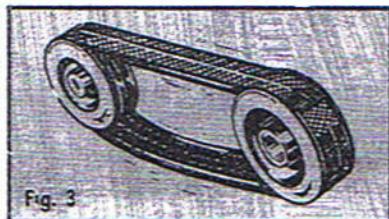
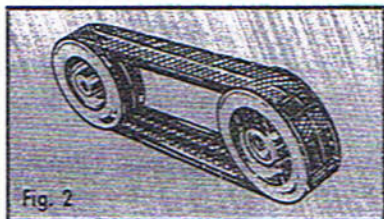
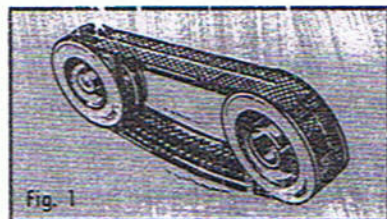
If you have any additional questions about drive tension on any kind of Ultra-V belt applications, see your Wood's Field Sales Engineer or nearby distributor.



CONVENTIONAL V-BELT DRIVE TENSIONING INFORMATION

With some experience it is generally acceptable to install Conventional V-belts with a slight 'bow' in the slack side of the belt as follows:

- Step 1.** Install belts and run the drives for a few minutes. Then adjust belt tension until there is a slight 'bow' in the slack side. Figure 1.
- Step 2.** Check the drive after a few day's operation. Readjust if necessary to obtain slight "bow" in the slack side.
- Step 3.** Give the belts a few days to become seated in pulley grooves; then tighten, if necessary, so that drive again shows a slight "bow" in the slack side. Your drive is now properly tensioned.



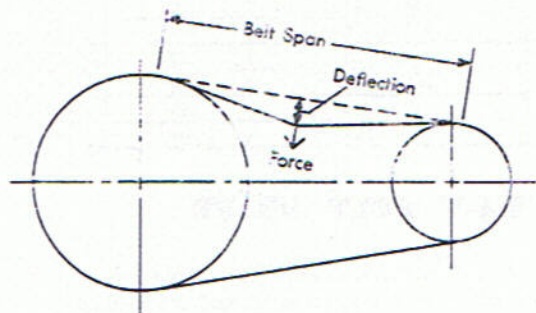
If you want to further check the tension of your Conventional V-Belt, as found from the easy steps outlined above, here is a convenient method to do so:

Step 1

After placing the set of matched belts in the sheave grooves take up the slack in the belts and start the drive. Tension the drive until the belts have only a SLIGHT BOW on the slack side of the drive while it is operating under load.

Step 2

Stop the drive and measure the belt span (See Sketch). Using a spring scale apply a force to any ONE of the belts in the center of the span. The force should be perpendicular to the span and toward the center of the drive. Measure the force required to deflect any one of the belts $\frac{1}{4}$ inch for every inch of span length. For example, the deflection for a 32-inch span is $\frac{1}{4}$ inch multiplied by 32, or 8 pounds.



Step 3

The amount of force required to deflect the belt should compare with the recommended values listed in table 46b. Initially, you should tighten the belts to the values listed in column A. There will normally be a drop in tension during the first 24 to 48 hours of operation. During this "run-in" period the belts seat themselves in the sheave grooves and initial stretch is removed. After a day or two the drive should be stopped again and another check made for the correct amount of tension. The tension should now compare with the values in column B. If the force is below the low value in column B, the belts are too loose and should be tightened. If the force is greater than the high value in column B, the belts are too tight and should be loosened so that the deflection force is between the high and low value in column B.

BELT DEFLECTION FORCE

Table 46b

(Pounds)

Cross Section	Small Diameter Range	STANDARD BELTS		SUPER BELTS	
		Deflection		Deflection	
		A "Run-In"	B Normal	A "Run-In"	B Normal
A	3.0-3.6	3 $\frac{1}{4}$	2 $\frac{1}{4}$	4 $\frac{1}{4}$	3 $\frac{1}{4}$
	3.8-4.8	4 $\frac{1}{4}$	2 $\frac{3}{4}$	5	3 $\frac{3}{4}$
	5.0-7.0	5 $\frac{1}{4}$	3 $\frac{1}{4}$	6	4
B	3.4-4.2	4	2 $\frac{1}{2}$	5 $\frac{1}{4}$	3 $\frac{1}{2}$
	4.4-5.6	6	4	7 $\frac{1}{4}$	4 $\frac{1}{4}$
	5.8-8.6	7 $\frac{1}{4}$	5 $\frac{1}{4}$	9	6
C	7.0-9.0	11 $\frac{1}{4}$	7 $\frac{1}{2}$	13 $\frac{1}{2}$	9
	9.5-16.0	15 $\frac{1}{4}$	10 $\frac{1}{2}$	17 $\frac{1}{2}$	11 $\frac{1}{4}$
D	12.0-16.0	24 $\frac{1}{2}$	16 $\frac{1}{2}$	28 $\frac{1}{2}$	19
	18.0-27.0	35	22	36	24
E	20.0-32.0	48	32

INSTALLING A WOOD'S CONVENTIONAL V-BELT DRIVE

INSTRUCTIONS:

1. Install the belts in the grooves without forcing.
2. Align the drive by the four-point method with a piece of string or a straightedge. The two sheaves will be aligned when two points (near and far) on the face of each of the sheaves touch the straightedge or the string when the string is a straight line.
3. Tension the belts by moving the motor back till only a SLIGHT BOW appears in the belts on the slack side of the drive while it is operating under full load.
4. If you wish to make sure you have applied the proper tension, STOP the drive and go through the steps listed below.

If you have any additional questions about drive tension on any kind of Conventional V belt applications, see your Wood's Field Sales Engineer or nearby distributor.

1		Homogenizing Valve Seat
1	06HP-7-137135	Valve Stem
5		Plinger Rods
4		
8	0034-RF	ABRASIVE DISK
39		TURBO Flow Homogenizing Valves
1		Valve Grinding outfit
2		Home Seat
3	562-S-1686-A	Balls
3		Seats
3	06HP-246965	Springs - followers
8	S-1313-30	"O" Rings
1		Homogenizing Valve
17	S1313-12	"O" Rings
3		Slaves
4		Valves
1	used	Home Valve Seat
10	C100-126	PINS
13	06HP-200237	Seal Ring
3	562-S-1686-A	Ball
3	06HP-246965	Followers
2	06HP-151998	Sp inserts
1	new	Home Valve Holder
46	06HP 301769	Adapter Jam
5		Valves

Spare Parts for 5DD Aoms

9	- 137H148 -	Spring
8	- 542-S-5077	Back up Ring
5	- 221-H173	"O" Ring
A	- 542-S-5077-B	Back up Ring
13	- 239-H-248	SEAL
4	- 239-H-708	SEAL SEAT
4	- 40059	SEAL
7	- 47059	SEAL
9	- S1313-16	"O" Ring
8	- 06HP151996	Gasket
3	- S1313-30	"O" Ring
5	- S-1313-20	"O" Ring
5	- S-1313-31	"O" Ring
2	- S-1313-18	"O" Ring
23	- S-1313-38	"O" Ring
9	- S-1313-32	"O" Ring
25	- S-1313-36	"O" Ring
1	- 137-H-694	Plug Valve
7	- S1313-37	"O" Ring
47	- 991005	Single Service Hose gazing
50	- 990201	"
5	- 06H-P-228292	Suct Values
14	- 543-P-221173	"O" Ring
2	- 621-P-137099	Bushing
6	- 205-H-883	"O" Ring
1	- 06H-P-151997	SH INSERT
23		PLUNGER PACKING
11		Valve Springs
		Valve Seat